Special Initiatives
Report 24

Case Study on the Costs and Financing of Immunization Services in Côte d'Ivoire

May 2000

Prepared by:

Miloud Kaddar, D.Econ.
Abt Associates Inc.

Vito L. Tanzi, Ph.D., M.P.H.
Abt Associates Inc.

Leanne Dougherty
Development Associates, Inc.

Abt Associates Inc. ■ 4800 Montgomery Lane, Suite 600
Bethesda, Maryland 20814 ■ Tel: 301/913-0500 ■ Fax: 301/652-3916

In collaboration with:
Development Associates, Inc. ■ Harvard School of Public Health ■
Howard University International Affairs Center ■ University Research Co., LLC

Funded by:
U.S. Agency for International Development

Partnerships
for Health
Reform
PHR

Mission

The Partnerships for Health Reform (PHR) Project seeks to improve people's health in low- and middle-income countries by supporting health sector reforms that ensure equitable access to efficient, sustainable, quality health care services. In partnership with local stakeholders, PHR promotes an integrated approach to health reform and builds capacity in the following key areas:

- *Better informed and more participatory policy processes in health sector reform;*
- *More equitable and sustainable health financing systems;*
- *Improved incentives within health systems to encourage agents to use and deliver efficient and quality health services; and*
- *Enhanced organization and management of health care systems and institutions to support specific health sector reforms.*

PHR advances knowledge and methodologies to develop, implement, and monitor health reforms and their impact, and promotes the exchange of information on critical health reform issues.

May 2000

Recommended Citation

Kaddar, Miloud, Vito L. Tanzi and Leanne Dougherty. May 2000. *Case Study on the Costs and Financing of Immunization Services in Côte d'Ivoire.* Special Initiatives Report 24. Bethesda, MD: Partnerships for Health Reform Project, Abt Associates Inc.

For additional copies of this report, contact the PHR Resource Center at pub_order@phrproject.com or visit our website at www.phrproject.com.

Contract No.: HRN-C-00-95-00024
Project No.: 936-5974.13

Submitted to: Robert Emrey, COTR
Policy and Sector Reform Division
Office of Health and Nutrition
Center for Population, Health and Nutrition
Bureau for Global Programs, Field Support and Research
United States Agency for International Development

Abstract

The government of Côte d'Ivoire has built a strong immunization program over the past five years and has seen significant gains in immunization coverage. In 1999, the Partnerships for Health Reform (PHR) Project, in collaboration with the World Health Organization and the Côte d'Ivoire Ministry of Health, conducted an in-depth study of the costs and financing of the country's immunization program, one of a series of four PHR country case studies on immunization financing. The objectives of the study are to estimate the current and future costs of the country's immunization program, to assist the ministry with program planning, to provide recommendations to the government and its partners on ways to improve the financial sustainability of immunizations activities, and to draw lessons learned from Côte d'Ivoire's immunization financing strategies for the international health community at large. Financing strategies for immunizations have become increasingly important to Côte d'Ivoire due to its heavy reliance on external funding through donors such as the European Union. Analysis and recommendations in this study are presented in the context of prospects for financial sustainability. Costs and financing data used in the analysis were obtained from government documents and interviews in the government and private sectors. The study estimates the share of financing by each major funding source, both in terms of the total estimated cost of the program and the "program-specific" costs, that is, costs that are incurred specifically for the delivery of immunization services. It also projects expenditures required for the next five years to enact a series of improvements to the program, including the introduction of Hepatitis B and the expected gap in funding. This report suggests ways to improve the program's financing in order to create a truly sustainable program based primarily on country-level resources, including central government allocations, as well as potential new resources. Recommendations encompass the areas of program planning, management, evaluation, research, vaccine procurement and supply, and financing structures.

Table of Contents

List of Tables

Annex Tables

List of Figures

Acronyms

AFP	Acute Flaccid Paralysis
AIDS	Acquired Immune Deficiency Syndrome
ASC	*Agent de santé communitaire* (Community Health Worker)
BCG	Bacille Calmette-Guerin (Vaccine against tuberculosis)
CDC	Centers for Disease Control and Prevention
COGES	*Comité de Gestion* (Management Committee)
DEMM	*Direction de l'Equipment et de la Maintenance* (Division of Equipment and Maintenance)
DHS	Demographic and Health Survey
DPPS	Division of Planning (*Direction de la planification)*
DPT	Diphtheria, Pertussis, Tetanus
DRSS	*Directeur regional des services de santé* (Regional Director of Health Services)
DSC	*Direction de la Santé Communautaire* (Division of Community Health)
EU	European Union
FCFA	*Franc de la Communauté Francophone d'Afrique* (West African Currency)
FIC	Fully Immunized Child
GDP	Gross Domestic Product
GTZ	*Gesellschaft für Technise Zusammenarbeit* (Agency for Technical Cooperation)
Hib	Haemophilis influenza type B
HIV	Human Immunodeficiency Virus
IEC	Information, Education, Communication
INHP	*Institut National d'Hygiène Publique* (National Institute of Public Hygiene)
IMF	International Monetary Fund
JICA	Japanese International Cooperation Agency
KFW	*Kreditanstalt fur Wiederaufbau* (German Development Bank)
MOH	Ministry of Health
NGO	Non-government Organization
NIDs	National Immunization Days
NIP	National Immunization Program
OPV	Oral Polio Vaccine
PHC	Primary Health Care

PHR	Partnerships for Health Reform
PMA	*Paquet Minimum d'Activités* (Minimum Package of Activities)
PSP	*Pharmacie de la Santé Publique*, (Public Health Pharmacy)
SSPIB	*Soins de Santé Primaire Initiative, Bamako* (Primary Health Care Initiative, Bamako)
TT	Tetanus Toxoid
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WHO	World Health Organization

Conversion Rate

US$ 1 = FCFA 600

Acknowledgments

We would like to give special recognition to Victor Sangaré, the National Immunization Program (NIP) director and René Coddy, the NIP regional advisor at the World Health Organization (WHO) office in Abidjan for their collaboration. We would like to thank the NIP staff: Kassi Nguessan, of the Abidjan district health center, Longboré Amman Barthelemy, the NIP coordinator for Abidjan, Seka N'Da Leon, the NIP coordinator for south Abidjan, and Daniel Le Touzé of the Ministry of Health (MOH). We would also like to thank Aka Tano Bian, Leonard Tapsoba, and Houssou Bienvenu Godefroy of the WHO office in Abidjan for their tremendous support and cooperation. We greatly appreciate the cooperation of Janine Saracino and Ouattara Sidi-Fota from the *Institute National d'Hygiene Publique*, as well as Kone Bamba and Yves Barjaud from the *Pharmacie de Santé Publique*. In addition we would like to express our gratitude to Karl Stahl and Abdoulaye Konda of *Kreditanstalt für Wiederaufbau*, and Philipe Swenen of the *Gesellschaft für Technische Zusammenarbeit* for their valuable assistance. We would like to thank Bernard Laborderie of the European Union, Gaston Sorgho of the World Bank, and especially Jean-Michel Ndiaye and Gepke Hingst of UNICEF for providing us with helpful material and careful review. We appreciate the thoughtful review and comments on the draft from Christine Ortiz, Joel Ladner, and Ulla Kou from WHO/Geneva. We also would like to thank PHR's Marty Makinen, and Ann Levin for their support and comments as well as Linda Moll and Nicole Phillips for their help in preparing the document. Most particularly, we would like to thank Souleymane Barry and Judith Robb-McCord, the USAID representatives in Côte d'Ivoire for their support and assistance. Finally we would like to express our appreciation for the continued support and encouragement of Steve Landry of the Child Survival Division of USAID's Office of Health and Nutrition.

Executive Summary

Background, Objectives and Methods

The Partnerships for Health Reform Project (PHR), in collaboration with the World Health Organization (WHO) and the Côte d'Ivoire Ministry of Health (MOH) conducted an in-depth case study on the cost and financing of immunization services in Côte d'Ivoire. This study, one of a series of four country case studies on immunization financing, was conducted in 1999. The main objectives of the study are to:

1. Draw lessons learned concerning immunization financing strategies in Côte d'Ivoire that other countries and the international health community can use in planning sustainable financing of immunization programs with country resources;

2. Estimate the current and future costs of the country's immunization program, including the additional costs of introducing new vaccines and other innovations and improvements, both to assist Côte d'Ivoire in planning its program and to update and add to the available information on immunization costs for the global community; and

3. Provide recommendations to the Côte d'Ivoire government on ways to improve its immunization financing strategies for the current program as well as for the introduction of additional vaccines and other improvements.

Cost and financing data for this analysis were obtained through government documents and in-depth interviews with key informants in the Ministry of Health, the Ministry of Finance, the private sector, international organizations, and the donor community. Estimates of the total costs of the National Immunization Program (NIP), as well as the recurrent variable costs for which financing must be found each year, were calculated. The financing analysis is based on the estimated costs as opposed to expenditures to make it possible to account for all resources to the program, including donor contributions, in-kind contributions from communities and from other (non-health) sectors of the government, and personnel time. The study estimates the share of financing by each major funding source, both in terms of the total estimated cost of the program and the "program-specific" costs, that is, the costs that are incurred specifically for the delivery of immunization services.

This analysis also projects expenditures required for the next five years to enact a series of improvements to the program, including the introduction of Hepatitis B, and the expected gap in funding. The report ends with a set of recommendations to improve the program's financing in order to create a truly sustainable program based primarily on country-level resources, including central government allocations and new potential resources.

Main Findings

Costs:

- The estimated overall total annual costs of Côte d'Ivoire's NIP is US$ 9.55 million. This is the equivalent of approximately US$ 0.41 per dose, US$ 24.29 per fully immunized child under one year and US$ 0.61 per capita. Sixty percent of these annual costsUS$ 5.8 millionare personnel costs, mainly the value of the time health workers devote to providing and managing immunization services. Vaccines account for 19.2 percent of total costs; capital costs (building space, equipment, vehicles, etc.) account for another 8.5 percent; and transportation costs 2.6 percent.

- The National Immunization Days (NIDs) make up almost 20 percent of the total estimated cost of the programUS$ 1.68 million per year.

- The additions and improvements to the program under consideration by the MOH for the next five years will more than quadruple the required annual funding the MOH must find for the programfrom approximately US$ 3 million to more than US$ 14 million per year. These improvements include introducing the Hepatitis B vaccine and auto-destructible syringes, replacing equipment, increasing coverage to 80 percent, and covering maintenance and operational costs of cold chain and vehicles.

Financing:

- In terms of the overall MOH budget, the total costs of the NIP channeled through the MOH accounted for approximately 5 percent of the total MOH budget in 1998. Total *program-specific* costs of the immunization program accounted for less than 2 percent of the MOH budget. The MOH paid 70 percent of the *total estimated costs* of the entire program in 1998; however, external resources in the form of European Union (EU) and other donor contributions account for more than 90 percent of the costs specific to the NIP, including its three main componentsvaccines, cold chain equipment, and supplieswhich are purchases requiring hard currency. The program is therefore vulnerable to any changes in external financing.

Funding of Immunizations in the Future:

- Funding for the NIP will have to increase substantially in the coming years if the government is to implement the planned changes and improvements. The gap between required funding, including improvements and projected funding available through the government and donor contributions will be approximately US$ 4 million per year for the next five years. Priority setting, cost saving measures, phasing changes, and mobilizing additional resources are all needed.

Conclusions and Lessons Learned

The major conclusions and lessons learned resulting from this analysis are the following:

- The government of Côte d'Ivoire has made progress over the past five years, as evidenced by the coverage rates during this period. Both the financing and procurement strategies

developed have greatly facilitated the improvements in the program's performance. However, coverage rates declined slightly in 1998 and even more so in 1999 due to budgetary constraints and resource limitations for the mobile and outreach strategies. Poor areas were particularly affected.

- Health indicators (in particular the infant mortality and under 5 mortality rates) reveal a negative and disturbing evolution in recent years, as shown in the Demographic and Health Survey studies of 1994 and 1998. The economic and social context as well as inequalities explain this trend.

- The vaccine and supply procurement system of the Public Health Pharmacy-National Institute of Public Hygiene (*Pharmacie de la Sante Publique-Institut National d'Hygiene Publique*, PSP-INHP) is well organized and seems highly effective, however, more competitive vaccine prices could be obtained through improved negotiation with producers and the use of the UNICEF supply system.

- Due to the budgetary assistance of the EU and the existing budget line item on vaccines, the vaccine supply is relatively regular at the central level and faces no major financial difficulty. The local supply system is more problematic and frequently faces logistical constraints.

- Huge investments were made in 1997-99 to replace the cold chain and add transportation resources at both the central level and in districts. However, the financing of operation and maintenance costs are a concern.

- The financing strategy is heavily dependent on the EU and other donors and is unlikely to be sustainable over the long term.

- The experience in Côte d'Ivoire demonstrates that there is some risk to using external funding, including EU budgetary aid, to fund the recurrent costs, such as vaccines, of an immunization program. Ideally, such a short-term approach would be accompanied by a plan for the gradual reduction in the use of the external funds and their replacement with local (country-level) resources. If this does not occur, the program can find itself in the difficult position of having to seek a large sum of replacement funds all at once from the government or from other external sources. External resources are best used for long-term investments, such as infrastructure improvements (e.g., cold chain); critical systems, such as diseases surveillance and routine immunization reporting; capacity-building; and perhaps to introduce new vaccines.

- To create sustainable long-term financing for the immunization program will therefore require financing of operational costs based largely on local resources. This can be accomplished by both increasing central government budget allocations through the operating budget and tapping into other local sources, such as insurance and local government and community contributions.

- External funding for vaccines and other critical program components has not only created a dependency on external support, but has perhaps also relaxed pressure for the efficient use of resources. This is most apparent in the large discrepancy the study found between the estimated vaccine needs of the country, using population projections and current wastage rates, and what the program actually buys each year. Using truly local resources to buy the

vaccines and other supplies would encourage changes in the way vaccine needs are determined, vaccine stocks are managed, and other resources are used.

- The significant wastage rate is aggravated by the absence of regular monitoring and supervision activities and by the fact that health personnel are not aware of the recommendations related to the open vial policy and norms.

- Finally, to establish an immunization program that is both successful and sustainable over the long term the Côte d'Ivoire government needs to develop a multi-year strategic plan for the routine program. This plan should be based, first of all, on the government's objectives and the immunization needs of the population~~wh~~ich in turn should be based on solid data~~an~~d then on the availability of resources. Making program plans and decisions based on such data will require improving the NIP's and MOH's capacity in planning, applied research, and coordinating with other agencies and departments both within and outside of the MOH. Information needed to plan a strong program includes:

  1) Data on disease burden, gathered through regular disease surveillance and reporting, and through special research studies, (to determine, for example, the need for and cost-effectiveness of new vaccines such as Haemophilis influenza type B [Hib]);

  2) An inventory of cold chain equipment and its condition, to determine replacement and operation needs. This will require an initial study of current equipment and needs, as well as a system to monitor and track equipment needs on a regular basis. The monitoring system would allow equipment to be replaced on a systematic and regular basis, rather than all at once.

  3) Data on the effectiveness and cost-effectiveness of different strategies, to reduce disparities in coverage and to improve overall coverage. Strategies include NIDs, regional or locally based campaigns, increasing routine outreach activities (through mobile health teams and other means), social mobilization activities, and building additional health facilities in underserved areas.

Recommendations

Based on the findings of this study and the ongoing health sector reforms, the following recommendations are made:

Program Planning, Management, and Evaluation

- The government should develop a national immunization strategic plan for the next 10 years, which includes program objectives; plans for the introduction of new vaccines and other improvements, based on the results of this study and future data collection and analysis; plans for conducting additional research to obtain critical information on which to base program decisions; plans for capacity building (training and technical assistance) in critical areas; and plans for financing the program in a sustainable manner, based largely on country-level funding and in conjunction with the planned health sector reforms.

- In the context of district annual planning, the program should develop detailed *annual* immunization plans, which should include: quantifiable coverage and other performance objectives by district or region; activities planned to increase coverage; and resources to be

mobilized by province. Annual planning will allow the program to more easily assess its performance on a regular basis and make necessary changes. The planning would involve the local NIP coordinators and other appropriate regional and departmental personnel, and would therefore also serve as a training exercise in program planning and evaluation, in anticipation of the decentralization of the NIP.

- The consideration and analysis of costs should be included in the program decision-making process on a more systematic and regular basis, along with the considerations of effectiveness and quality. This is especially critical as the government and other internal resources finance more and more of the program in the future. The dimension of cost and cost-effectiveness should be taken into account when considering the introduction of Hepatitis B or other new vaccines; the type of single-use syringe to procure (auto-destructible vs. regular disposables); the best ways to improve outreach; whether to introduce a new vaccine such as Hib; and so forth. To more systematically include cost considerations in the planning of the NIP would require the following:

    - Following up this study with district-level cost analyses to obtain further information on costs at the local level, the costs of different delivery strategies (e.g., mobile health teams, home visits, mini-campaigns), and the costs of delivering services under different conditions (e.g., rural vs. urban settings);
    - Providing training to NIP staff on cost and financing analysis for immunization and other public health activities, and to those responsible for immunization activities at the regional or district level on cost analysis and its practical use in program planning and implementation; and
    - Collecting cost data on a regular basis by including cost information on routine NIP reporting forms and in coverage or evaluation surveys.

- Training in different aspects of planning, management, and evaluation should be provided to the NIP staff to build long-term capacity in these areas. This can be accomplished through the staff's involvement in the development of a long-term strategic plan with outside technical assistance as well as through short-term intensive training sessions and refresher courses.

- Planning for the effect on the NIP of eventual decentralization of the health system should begin soon and be incorporated into the long-term NIP strategic plan. Responsibilities of regional and district authorities will likely increase and could include maintaining and financing regional cold rooms, distributing vaccines and vaccine supplies to the provinces, replacing cold chain equipment, and planning and implementing more targeted mini-campaigns that could eventually replace NIDs. Plans for decentralization should include identification of training needs for regional- and provincial-level personnel in planning, financing, management, estimating vaccine needs, etc.; training plans based on identified needs; clear identification of central vs. regional- and provincial-level roles and responsibilities; and plans for coordination between the central and other levels. The role of the central-level NIP should change accordingly to move away from the day-to-day management of the program to overall planning and coordination, including such functions as the following:

    - Setting strategic objectives and determining new approaches;
    - Developing management, reporting, and evaluation tools;
    - Procuring vaccines and supplies for the country;

- Coordinating with other health programs and divisions involved in preventive health services, epidemiology, primary health care, etc.
- Doing financial planning and budget setting at the national level;
- Collecting, analyzing, and disseminating information (e.g., on coverage rates, routine service delivery statistics, disease surveillance);
- Providing technical assistance to decentralized levels; and
- Doing research, assessment, and evaluation.

The new role of the NIP should support decentralization and integration of program activities at the regional and district level.

Applied Research

Plans for the future of the program, including the introduction of new vaccines and technologies and the diversification of financing sources and mobilization of new resources, should be based on information concerning needs, effectiveness, costs, and cost-effectiveness. Given the program's objectives and plans for the future, the following applied studies and analyses are recommended at the central and provincial levels:

At the national level:

- An inventory study of the current cold chain system with periodic updates to determine the numbers, types, and condition of equipment in use; the equipment and storage needs for the next 10 years or so; and the type of system to put in place to maintain, manage, and monitor the system on a regular basis. Maintenance and operation issues are crucial to address both in terms of financing and local capacities;

- A study on the current and potential role of the private sector in immunization service delivery and financing to help determine: the current participation of the private health sector in delivering immunization services; the ways to increase the role of the private sector without compromising quality; the obstacles to increasing private sector involvement; the impact on coverage and equity of access that greater involvement of the private sector would have, if any; the potential impact of expanding insurance coverage on private sector participation in immunization service delivery; and the potential pros and cons of various incentives for the private sector;

- For mid-term planning, studies on the burden of disease targeted by new vaccines, such as Hib and rotavirus, to determine which vaccines to introduce, to which target population, and when;

- An analysis of what a future measles elimination campaign would involve in terms of target population, length of time to achieve elimination, costs, financing, involvement of other sectors of the government and of society, diversion of resources from other NIP and MOH activities, and so forth. It would be interesting to complete a cost-effectiveness study comparing the vaccination campaigns against measles to a policy of strengthening coverage rates for children under one year and effectively covering the target population by a second dose at six years.

At the district level:

- An analysis of the differences in immunization coverage by area and socio-economic level of the population in order to determine effective strategies for improving coverage in low performing areas;

- A study on ways to improve immunization coverage, considering the effectiveness, costs, and cost-effectiveness of different delivery and social mobilization strategies, including NIDs; local-level mini-campaigns; increased outreach through mobile health teams, home visits, etc.; and different types of information, education, communication, and social mobilization strategies;

- An analysis for each district of the potential for reducing vaccine wastage, for which antigens, and how to reduce wastage.

Vaccine Procurement and Supply

- The PSP imports vaccines and supplies from the open market using tenders and bids to organize competition among suppliers. The INHP plays an important role and deals with the reception, storage, and distribution of the vaccines and other products useful for NIP activities.

- An evaluation of the performance of this procurement organization is needed. The question of the functions and the responsibilities is to be clarified, for example, for the estimate of the needs, the determination of the priorities, and the management of the budgetary constraints. Evaluations are necessary to maximize the benefit of the accumulated experience.

- The Côte d'Ivoire government should establish a national authority for the control of biological products. WHO can assist in the formation and training of the control authority.

- The NIP/INHP staff should adopt a method of determining vaccine needs for each antigen based on actual projections of the target population and on current vaccine wastage rates in Côte d'Ivoire. The MOH technical staff should be able to receive training from the donor community on this method, as well as how to develop and negotiate an international tender and bid for vaccines and how to manage and monitor vaccine stocks. Improved stock management potentially could save 20-40 percent in vaccine costs per year. Systems should also be developed to assist with these tasks.

- The MOH should conduct an assessment with the regions and districts to determine the potential for reducing vaccine wastage, and how to achieve this. A plan for reducing wastage, followed by appropriate guidelines and training of central and district staff, should then be developed, based on the results of the assessment.

- In order to purchase Hepatitis B vaccine, the MOH will have to gradually increase its budget to cover the vaccine and supply costs and not to rely solely on external contributions.

Financing

- The government of Côte d'Ivoire needs to "internalize" the financing of its NIP over the next five years by increasing its central government allocations to the program and exploring the

feasibility and making plans for mobilizing new resources, including revenue from PSP and INHP, health insurance reimbursements and local government contributions. The government should plan on financing from its own funds 100 percent of the basic vaccines and vaccine supply needs.

- Create a NIP assistance fund or coordinating mechanisms that would assemble all external contributions to immunizations. The objective of the fund would be to allocate resources for immunizations in an integrated fashion according to the priorities defined by the health authorities. This fund would avert short-term allocations made without consideration for the longer term and clarify and simplify the national immunization effort. The type of management of such a fund would have to be determined.

- The MOH, PSP and INHP should explore the option of using cross subsidization between NIP and non-NIP vaccines in order to finance vaccines offered in the public sector. An in-depth study is needed to make decisions in this matter.

- A study on the options of contribution of the PSP and the INHP to the financing of the vaccines, supplies, and other expenses, such as maintenance and operation of the cold rooms should be conducted. The pricing of services, the commercial margins, and the range of the activities and the services offered by these organizations are to be evaluated. Their contribution could be substantial and would make it possible to widen the base of local NIP financing. Careful thought on the priorities of vaccination, the price policy, and the role of the PSP and the INHP is needed in order to make strategic decisions.

- A study of cost recovery and out-of-pocket payments for government immunization services should be carried out to determine the extent to which cost sharing is currently practiced in the government sector, including charging a fee for vaccination cards; to analyze the amount of revenues generated and the uses of these revenues; and to analyze the feasibility of officially instituting cost sharing for immunization services in the government sector and the possible impact on financing, coverage, and equity.

1. Introduction

1.1 Background and Purpose of Study

In recent years, national governments and the international health community have become increasingly concerned with the issues of financing childhood vaccines and immunization programs. Despite tremendous gains achieved in immunization coverage in the 1980s in nearly all developing countries with the establishment of national immunization programs, coverage rates in the 1990s have reached a plateau or even declined in a number of countries as donors reduce their funding for immunizations, as national health budgets decline with deteriorating economic conditions, and as other national health priorities consume increasing attention and limited health funds.

With support from the Child Survival Division of the Office of Health at the United States Agency for International Development (USAID), the Partnerships for Health Reform (PHR) Project has developed a Special Initiative on Immunization Financing. Its goal is to assist in the evaluation and development of country-level financing strategies for replacing donor funding and sustaining and expanding immunization programs with local resources. One of its main activities is to conduct several country case studies on immunization financing in order to provide lessons learned concerning country-level immunization financing strategies that other countries and the international health community can use in planning sustainable national immunization programs, including the introduction of additional vaccines; and to provide recommendations to the individual countries involved in the studies on ways to improve their immunization financing strategies.

Each country case study examines the current financing strategies (in terms of their adequacy; sustainability; and impact on coverage, quality, equity and efficiency); estimates the global costs of the program and the costs of adding new vaccines (under various scenarios) or other innovations; and analyzes and weighs various options to improve the financing and sustainability of the program. These options include changing vaccine procurement mechanisms, increasing central government allocations to national immunization programs, reducing costs, increasing the role of the private sector in immunization service delivery, and mobilizing resources through different types of cost recovery.

Côte d'Ivoire was chosen by PHR and the World Health Organization (WHO) as the fourth country case study[1] because of the expressed interest of the Ivorian Ministry of Health (MOH) and the USAID Mission, and because it met most of the criteria established by PHR for selecting countries. These criteria include progressive increases in coverage rates as well as the planned introduction of additional vaccines. In addition, Côte d'Ivoire presented an alternative scenario with the use of the open market as a vaccine procurement strategy. Côte d'Ivoire is the only country in the case studies~~as~~ well as the only country in West Africa ~~to~~ purchase vaccines on the open market rather than using the UNICEF system.

To conduct the case study in Côte d'Ivoire, a joint PHR/WHO team was formed, consisting of two health economists and a research assistant from PHR. This team was joined by the head of Côte

[1] Bangladesh, Colombia, and Morocco were the other countries studied.

by the PHR team was made in July 1999 and was followed up by a second visit in October of that year.

The first chapter of the paper describes the country context of the NIP in the Côte d'Ivoire, while the second chapter presents the study objectives and methods. The third and fourth chapters present information on costs and expenditures of the program as well as sources of financing. The fifth chapter describes the future financing needs of the program. The last chapter describes the conclusions and recommendations of the study.

1.2 Socio-Economic Context of Côte d'Ivoire

Côte d'Ivoire is located in West Africa, bordering the North Atlantic Ocean and lying between Ghana and Liberia. It has a land area of 318,000 square kilometers, roughly the size of Germany, and a population of approximately 15,695,251 people. Table 1 lists selected demographic indicators for the country.

Table 1. Selected Demographic Indicators

Indicator	1998
Total population	15,695,251
Population density	49 people/km^2
Population growth rate	3.5%
Life expectancy at birth	55.6 years
Adult literacy rate	42.4%
Literacy rate	70%

Source: MOH, 1998

Administratively, the country is divided into 58 departments and 42 health districts. The population is 60 percent Muslim and 22 percent Christian; 18 percent of the population practices indigenous religions.

Côte d'Ivoire is among the world's largest producers and exporters of coffee, cocoa beans, and palm oil. Consequently, the economy is highly sensitive to fluctuations in international prices for these products and to weather conditions. The economy is still largely dependent on agriculture and related activities, which engage roughly 68 percent of the population.

The level of poverty remains high. The per capita income was about $700 in 1998. In addition, more than one-third of the population has an income level below the poverty line (World Bank, 1998).

The economic history of the Côte d'Ivoire is marked by fiscal shocks, due to variations of the prices of its principal exports, and to fluctuations of growth rates. After a period of economic growth in the 1960s and mid-1970s, the 1980's and 1990's were affected by structural adjustment programs.

After a decade and a half of lagging performance (1979-1993), the Ivorian economy began a comeback in 1994, due to the devaluation of the West African franc (*Francs de la Communauté Francophone d'Afrique*, FCFA) and improved prices for cocoa and coffee, growth in nontraditional primary exports such as pineapples and rubber, limited trade and banking liberalization, offshore oil and gas discoveries, and generous external financing and debt rescheduling by multilateral lenders

and France. The 50 percent devaluation of Franc Zone currencies on 12 January 1994 caused a one-time jump in the inflation rate to 26 percent in 1994, but the rate fell sharply to 3.5 percent in 1996-98. Moreover, government adherence to donor-mandated reforms led to a jump in economic growth to 6 percent annually in 1996-98.

On the budgetary level, small improvements in receipts (22.5 percent of the gross domestic product [GDP] in 1996, compared to 22.1 percent in 1995) have helped improve public expenditures for primary education. The monetary situation has also benefited from improvements of external assets, a moderate rise of the interior appropriations (1.8 percent), and banking structure reforms. In 1996, the Central Bank for West African Countries (*Banque Centrale des Etats de l'Afrique Occidentale*) lay the groundwork for banking regulations by developing banking reserve levels. The current account deficit has also been reduced.

Despite the economic growth, foreign and commercial debt remains formidable. The net present value of both the debt and servicing the debt represents 357.6 percent and 25.5 percent, respectively, of export earnings of goods and services. Therefore, just paying the interest on the debt consumes a large part of public revenue that could otherwise be allocated to health programs and alleviating poverty. The International Monetary Fund (IMF) and World Bank have been working with Côte d'Ivoire on financial stabilization and structural reform. They have helped Côte d'Ivoire reduce its debt servicing by about $800 million. However, the reduction in debt servicing has several conditions that must be adhered to due to past failures in the management of public finances and the implementation of the economic reforms. At the time of this study, loan disbursements had been suspended pending an IMF review of the country's adherence to conditions of the loan.

1.3 Health Status Indicators

Côte d'Ivoire has experienced very high rates of population growth for several decades. This increase is due to a large immigration from neighboring countries and to a traditionally high birth rate. Between 1980 and 1997, the population nearly doubled, from 8 million to approximately 15.6 million. At the same time, the country has made progress in lowering fertility and mortality rates. The total fertility rate, the average number of children per woman, declined from 7.4 in 1980 to 5.1 in 1996 (World Bank, 1998).

Table 2. Selected Health Status Indicators

Mortality	Indicator
Crude mortality rate	12%
Maternal mortality	597/100,000
Infant mortality	8%
Mortality under five years	15%
Incidence of diarrheal illnesses	47.%
Incidence of acute respiratory infections	99.%
Incidence of measles	2.%
Incidence of pertussis	0.3%
Number of neonatal tetanus cases	324
Number of polio cases	3

Source: MOH, 1997b

Child and infant mortality rates have slowly decreased. In the late 1970s the child mortality rate (children 0-five years of age) was 181 per 1,000 and has been reduced to 149 per 1,000 as of the early 1990s. Moreover, according to the 1998 Demographic and Health Survey (DHS), the infant mortality rate has decreased from 112 in the 10 years preceding the 1994 survey to 91 per 1,000 in 1998 (*Minstère de Planification et de la Programmation de Developpment*, 1999, p. 20). Juvenile-infant mortality rates however, have increased in the last 10 years due to the difficult economic and social situations. The DHS also found that more than 26 percent of infants less than three years of age suffered diarrhea during the two weeks prior to the survey. Childhood diarrhea is particularly dangerous in children six months to 23 months of age, when their immune systems are not fully developed.

The main causes of child morbidity and mortality are preventable and include acute respiratory infections, diarrhea, malnutrition, malaria, measles, and neonatal tetanus. One explanation for the continued importance of infectious diseases in Côte d'Ivoire is the lack of basic sanitation among the population. Although most of the population (72 percent) has access to clean drinking water, only 54 percent has access to adequate sanitation facilities.

More and more children are being infected by HIV (human immunodeficiency virus) through transmission from their mothers. AIDS (acquired immune deficiency syndrome) is the second biggest cause of maternal mortality striking mostly women of reproductive age.

In the past five years the NIP has produced increased vaccine coverage rates for children age 12-23 months. However, rates vary tremendously by region of the country and by rural/urban areas. There appears to have been a decrease in coverage rates in 1998 and 1999, due to delays in budgetary transfers to the vaccination program and basic health services that have slowed mobile and advanced strategies and supervision activities.

1.4 Government Health System

The great majority of health care in Côte d'Ivoire is provided by the government's health care system, run by the Ministry of Health and consisting of a network of hospitals, health centers, and dispensaries. There are currently 74 public hospitals in the country, which include rural, provincial, regional, and national hospitals. The hospitals have a total of approximately 5,850 beds, for a ratio of one public bed per 2,700 inhabitants (MOH, 1998) (Table 3).

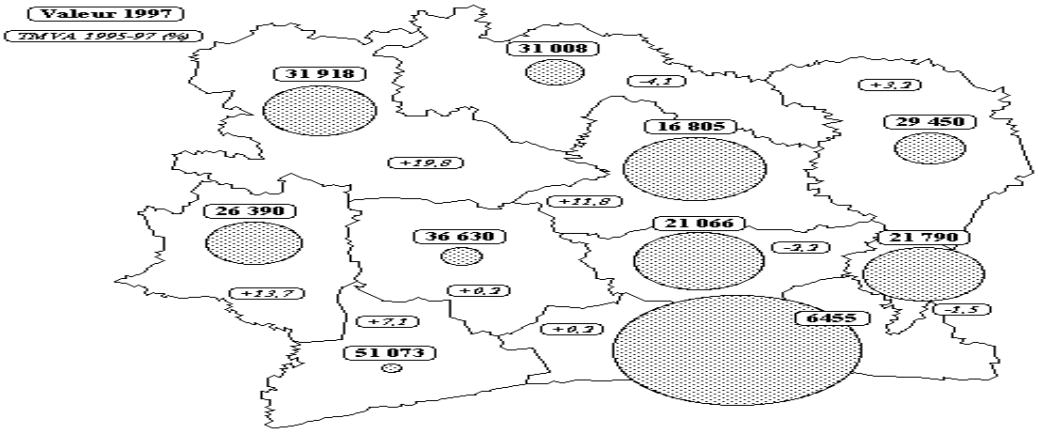
Table 3. Health Resources Per Capita

Structural Resources	
Primary health facilities	1 facility per 13,804 capita
Hospitals	1 hospital per 230 813
Hospital beds	1 bed per 2,700
Operating rooms	1 room per 448,500
Hospital laboratories	1 laboratory per 338,000
Radiology equipment	1 apparatus per 448,400
Human Resources	
Doctor	1 doctor per 12,486
Nurses	1 nurse per 3,885
Women of childbearing age/midwife	1 midwife per 1,913

Source: MOH 1998

Primary health care services, including immunization services, are largely provided through a network of approximately 950 dispensaries and rural health centers. Health centers are staffed by primary care physicians in urban areas, and nurses and nurse aides in the rural sector. Health care in rural areas continues to be a big problem. For example, Côte d'Ivoire overall has one public sector doctor for every 12,500 inhabitants. Contrasting regions, however, in the south there is one doctor for every 6,500 inhabitants, while in the southwest there is one doctor for every 49,280 inhabitants (Figure 1). The same problem occurs with nurses where there is nationally one nurse for every 3,900 inhabitants, one per 2,920 in the south, and one per 9,730 in the southwest. Moreover, more than 4 percent of the population live more than 20 kilometers from a health facility and more than 30 percent lives between 5 and 20 kilometers from a health facility.

Figure 1. Ratio of Population/Doctors by Region, Côte d'Ivoire, 1995-1997



Source: MOH, 1997b

While the number of doctors, nurses, and nurse aides has also grown tremendously in the past several decades, the majority of health personnel, including of public sector physicians, and of nurses and other paramedical staff, are concentrated in urban areas, especially in the south, around Abidjan. There are approximately 1,250 physicians, 3,355 nurses, and 1,600 midwives working in Côte

Immunization services are largely provided by nurses and nurse aides operating from health centers, dispensaries, and hospitals. The NIP in each of the country's 42 health districts is the responsibility of a full-time NIP coordinator, usually a nurse. The district-level staff are responsible for ordering and storing vaccines for the entire province, maintaining the cold chain, monitoring routine immunization activities, reporting immunization and other primary health care (PHC) service statistics to the central level, and organizing the National Immunization Days (NIDs) and mini-campaigns at the provincial level.

1.5 Role of the Private Sector

The private health sector in Côte d'Ivoire can be divided into not-for-profit providers and commercial providers. The non-profit providers are non-governmental organizations (NGOs). NGO facilities are an important provider of family planning services; they also provide a variety of preventive services and limited curative care.

The commercial private sector provides mainly curative care services in Côte d'Ivoire; its involvement in preventive care services, such as family planning and immunizations, is minimal.

1.6 Côte d'Ivoire's National Immunization Program

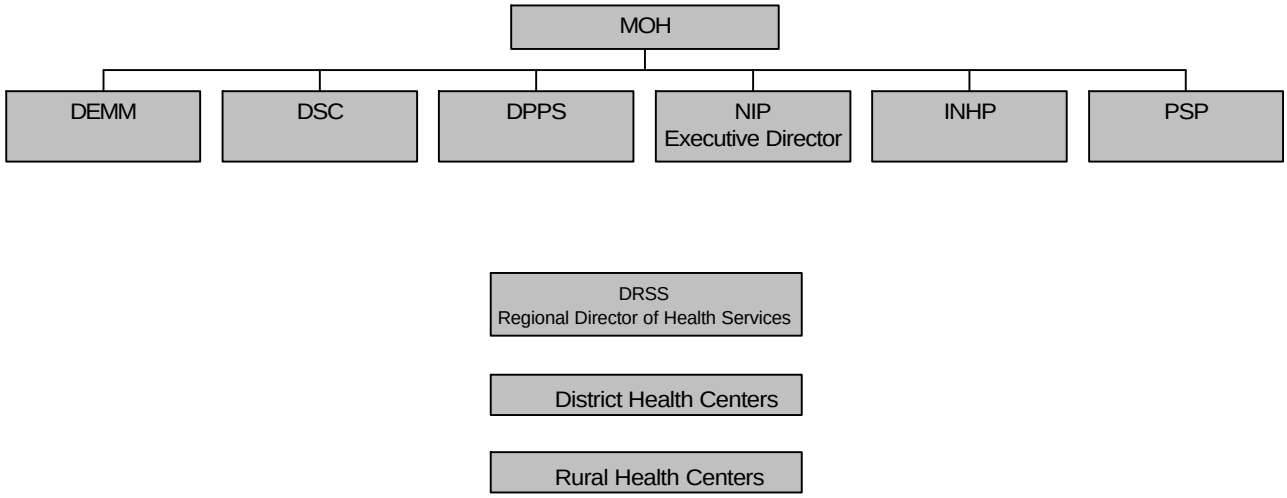
1.6.1 History of the Program

In 1978, the government of Côte d'Ivoire expanded immunization activities to include rural areas. This resulted in the establishment of a NIP. It was not until 1987, when external support was mobilized and clear strategies were developed, that a significant increase in immunization coverage rates occurred. During the period 1988-1995, vaccination activities were organized by the MOH Division of Community Health (*Direction de la santé communautaire*, DSC), and the National Institute for Public Hygiene (*Institut National de Hygiene Publique*, INHP) in coordination with the Division of Equipment and Maintenance (*Direction de l'équipement et de la maintenance*, DEMM) and the Division of Planning (*Direction de la planification*, DPPS). The DSC was responsible for managing routine activities. The INHP was responsible for planning vaccine and supply needs, defining immunization strategies, purchasing vaccines, and conducting inventory and distribution. Health facilities at the district and rural level were responsible for providing immunization services. Despite these improvements, poor coordination led to stagnant coverage rates.

In 1995, the NIP was reorganized. A line item was created for vaccines, supplies, and NIP organization in the MOH budget. With the establishment of the budgetary line item, the MOH created the executive director of the NIP office. The NIP office in collaboration with the DSC, DEMM, and DPPS became responsible for defining, implementing, and monitoring national vaccination strategies. The NIP director developed a five-year plan for 1996-2000, implemented the policy of single-use injection needles, and launched the NIDs to help eradicate poliomyelitis. The Regional Director of Health Services (*Directeur regional des services de santé*, DRSS) for the MOH was integrated into the NIP as well. In addition to these changes, the Public Health Pharmacies (*Pharmacie de la Santé Publique,* PSP) became responsible for purchasing vaccines and supplies. Although the PSP is funded largely through the MOH, it operates as a separate, autonomous entity. The INHP continues to plan vaccine and supply needs as well as conduct inventory and distribution. During this period, a national immunization committee was formed. The committee, made up of key MOH officials, immunization experts, as well as private and public professionals working with immunization services, acts as an advisory committee to the NIP. It is responsible for defining the objectives and strategies of the program, as well as conducting evaluations. Regional committees of local authorities, health representatives, members of the population as well as public and private professionals also were formed, to assist in the execution of activities proposed by the national immunization committee. Health facilities continue to provide immunization services.

The significant restructuring of the NIP in 1995 led to increased immunization coverage rates, but some structural problems also resulted. The responsibilities of each actor are unclear. For example, the responsibility of determining vaccine and supply needs are simultaneously carried out by the INHP and the NIP director. In addition, the decision making process concerning the introduction of new vaccines and technologies is problematic since the INHP, the national and regional committees, and the NIP director all play a role.

Figure 2. National Immunization Program Organizational Chart, 1995-2000



1.6.2 Objectives of the National Immunization Program

The objectives established by the NIP for 1996-2000 are to:

- Reinforce the routine activities of the NIP in order to reach a coverage rate of 80 percent
- Eradicate poliomyelitis
- Eliminate neonatal tetanus
- Control measles and yellow fever

In addition to the objectives established for the five-year plan, in 1999-2000 the NIP sought to increase geographical access to immunization services for 80 percent of the target population and to increase utilization rates to 90 percent for the entire country. Table 4 shows the target populations from 1998-2001.

Table 4. Target Population

Indicator	1998	1999	2000	2001
Total population	15,695,251	16,166,108	16,651,091	17,150,625
Infants under one year	606,480	628,920	652,190	676,321
Women of reproductive age (15-49 yrs)	3,199,505	3,295,490	3,394,354	3,496,185

To ensure that these objectives are met, the Côte d'Ivoire is implementing a decentralization process intended to give more decision-making power to the district and rural health centers. The government is also trying to integrate the NIP within the primary health care division of the MOH. To improve vaccine quality, the government is replacing the cold chain equipment and vehicles with donations from the German Development Bank (*Kreditanstalt fur Wiederaufbau*, KFW) and Japanese International Cooperation Agency (JICA). The NIP is implementing training, monitoring, and

supervision programs, and it is trying to reinforce the surveillance system for the six target diseases of the NIP.

1.6.3 Vaccination Schedule

The schedule recommended by WHO and UNICEF and adopted by the NIP as "routine immunizations" consists of one dose of Bacille-Calmette-Guerin (BCG, tuberculosis vaccine) at birth, which is required in order for a child's birth to be officially registered; three doses of diphtheria/pertussis/tetanus (DPT), at six, 10, and 14 weeks; four doses of oral polio vaccine (OPV), including a birth dose and then at six, 10 and 14 weeks; and one dose of measles at nine months of age. The schedule also calls for a total of five doses of tetanus toxoid (TT) for women of reproductive age: one dose as soon as possible for all women of reproductive age or as early in a pregnancy as possible, another at least four weeks after the first to fully protect the current pregnancy, and three more over the next year and a half to protect future children. In addition to the traditional vaccine, Côte d'Ivoire has implemented into the NIP the yellow fever vaccine, which is provided at nine months. Annex A presents the national vaccination schedule in tabular form.

1.6.4 Delivery Strategies

The NIP uses a number of different strategies to deliver immunizations. The principal strategy is the use of fixed delivery points: health centers, dispensaries, and local hospital outpatient services. Immunization services are offered on average two to three times a week at these health facilities. The urban facilities offer services more frequently than rural health centers and dispensaries. Mainly certified nurses and health assistants administer immunizations.

A second strategy, used at the rural level, is outreach activities. The nurse or midwife at the rural health center conducts this activity in collaboration with volunteers at the health center or with community health volunteers (*Agents de santé communautaires*). Depending on the logistical capacity of the health center, the nurse visits all villages within a 10 km radius of the health center once a month to offer immunization services. Insufficient resources for transportation limit this approach.

A third strategy, used in isolated rural areas, involves visits by mobile teams. In principle mobile teams consist of a doctor and two nurses, operating from district health centers. These local visits are organized at the district level and depend on the availability of local transport and equipment. The use of mobile teams therefore varies widely from district to district; while they are supposed to make visits to target areas every two months, some teams only make visits once or twice a year, according to the NIP.

A fourth delivery strategy, which the NIP considers crucial to eradicate polio throughout the country, is the holding of NIDs, as described below.

1.6.5 National Immunization Days

National Immunization Days began in 1995 as part of the worldwide polio eradication campaign. They take place for three days in February each year, with a second round held in March. These campaigns, largely funded by donors, are truly a national event with intensive social mobilization from the national to the local level. More than 7,000 volunteers (mainly students and teachers) help organize and carryout the NIDs. The NIDs have received considerable support from donors, including

Rotary International and JICA (for OPV and cold chain supplies), UNICEF, WHO, and USAID (for social mobilization, and transport costs).

Vitamin A supplementation was added to the NIDs beginning in April 1999, with capsules donated by the Canadian International Development Agency. The target population is all children age six months to five years. The dose administered to children is 100,000 U.I. for children six to twelve months old, and 200,000 UI for children one to five years.

1.7 Results of the National Immunization Program

1.7.1 Results of Routine Program

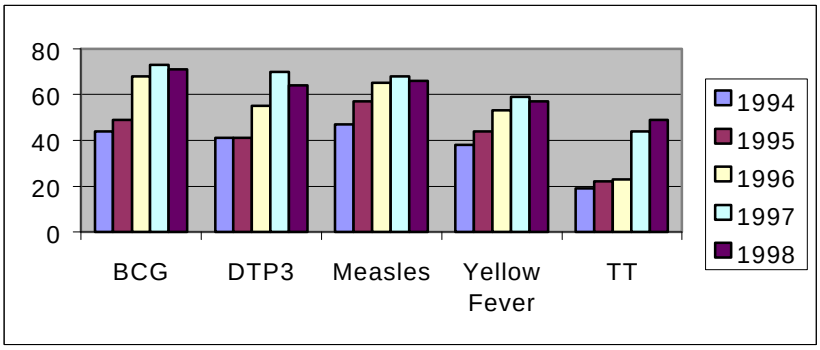
Despite declines in immunization coverage rates in individual years, for reasons discussed above, the NIP has increased overall vaccination rates for children dramatically. Table 5 shows this steady progress, giving coverage rates for seven antigens from 1986 to 1998.

Table 5. NIP Vaccination Coverage for Children under One Year, 1986-1998, in percentages

Year	BCG	DPT3	Measles	Yellow Fever	Tetanus Toxoid (VAT2)
1986	28	20	29	30	NA
1987	55	51	82	76	NA
1988	40	25	23	NA	NA
1989	48	42	33	NA	NA
1990	43	33	39	NA	NA
1991	65	54	57	44	NA
1992	51	49	54	NA	NA
1993	53	50	52	37	NA
1994	44	41	47	38	19
1995	49	41	57	44	22
1996	68	55	65	53	23
1997	73	70	68	59	44
1998	71	64	66	57	49

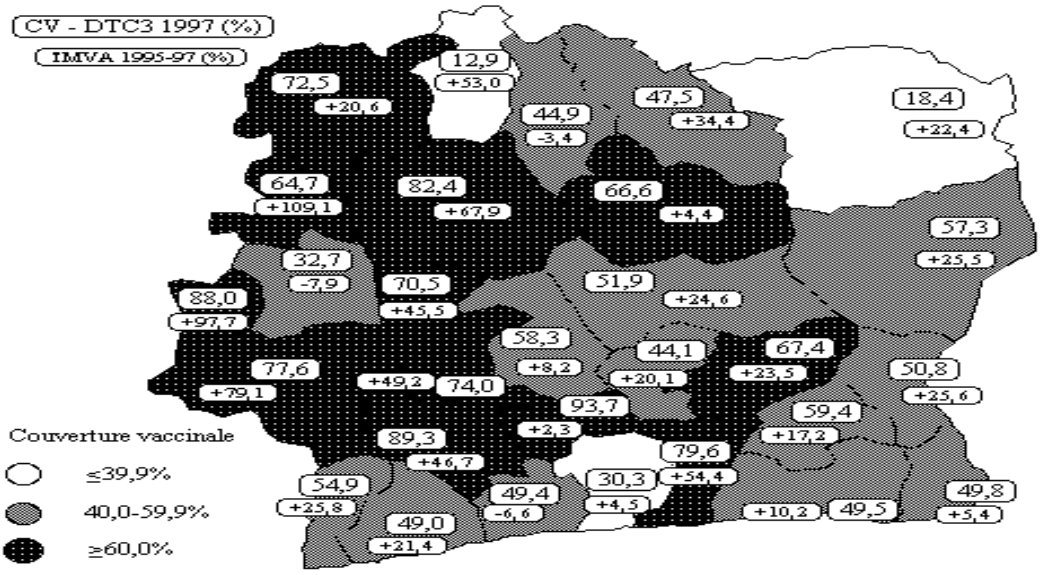
Figure 3 illustrates the same phenomenon, for the years 19941998.

Figure 3. Vaccination Coverage Rates by Antigen, 1994-1998, in percentages



Coverage rates, however, vary tremendously by region and are still under the 80 percent objective (Figure 4). For example, in 1997 the national coverage rate was 48.3 percent but it was 73.4 percent in the districts of Sassendra and Man. In Tabou only 13 percent of children under the age of one year received the third injection of DPT. By region, the highest coverage rates are seen in the south (54 percent) and the worst are in the west (40.4 percent). The same situation applies to measles vaccine coverage, which reached 98 percent coverage in Sassendra and Korogho in 1996 but was only 18.8 percent in Tabou. It is important to note that the variance in coverage rates may be a reflection of the wide population movement experienced throughout the Côte d'Ivoire. Refugees from Liberia, migrants from bordering countries, and internal movement from north to south during agricultural periods may affect the estimated target population and therefore alter coverage rates.

Figure 4. DPT3 Coverage Rates for Children <12 months of Age by Region 1995-97



Source: MOH, 1997b

In addition to the wide disparities in coverage rates by region, differences may be observed by other demographic characteristics. For example, there is a progressive increase in coverage rates based on income. In 1994, the poorest children between the ages of 12-23 months obtained a 26 percent DTP3 coverage rate while the richest children in that age group achieved a 73.9 percent rate. When comparing rural to urban areas, one finds that middle-income children in rural areas achieve

38.6 percent DPT3 coverage rate while, urban middle-income children achieve a 67.9 percent DPT3 coverage rate. There are also differences in coverage rates based on gender. Coverage rates of female children between the ages of 12-23 months are on average 10 percent lower than male children at the same age.

Improvements to the vaccine program are the result of strong political backing, a line item budget for the NIP, and good coordination between the district-level health workers and the community. Some of the main weaknesses of the vaccine program are insufficient activities in the rural sector, poor training in management of the NIP budget, poor surveillance of the target diseases, poor maintenance of cold chain equipment, insufficient supervision at the rural level, late dispersal of funds for the NIP from the government, and underestimates of the number of cases of acute flacid paralysis (AFP) and neonatal tetanus. See Annex B for additional information.

1.7.2 Results of NIDs

Nearly 50 percent of all doses of OPV are delivered during the NIDs. This is largely because the target population for the polio eradication program~~all~~ children under the age of five~~is~~ much larger than the normal target population of under one year olds who receive immunizations at health centers (see Table 6).

Table 6. NIDs Coverage Rates 1997-1999, as Percentages of Overall Target Population

Year	Ist Round Coverage	2nd Round Coverage
1997	80	99
1998	99	109
1999	105	112

Source: NIP Executive Director

Regarding the Vitamin A component of the NIDs, an estimated 2.3 million children, approximately 80 percent of the target population, were given Vitamin A capsules during NIDs in April 1999.

1.8 Future of the National Immunization Program

The MOH is exploring and planning a number of additions, innovations, and other changes to the National Immunization Program and to the health sector as a whole. Analysis of how these changes will affect the cost and financing of the Côte d'Ivoire's immunization programunder different scenarios and assumptions~~co~~nstitutes a major component of this study. The major planned changes that this study will consider are the following:

- **Replacing and maintaining the cold chain system**

  One of the main achievements of the NIP in 1997-99 was to replace a large part of the country's cold chain equipment. External donors (i.e., JICA, KFW) donated most of this equipment; however it is the government's responsibility to maintain the equipment, provide resources for operating it, and assess the need for new equipment. This study estimates the future costs of improving the cold chain system to include additional cold rooms, and equipment such as refrigerators for the NIP. The construction of additional cold

rooms in several regions would fit with the government's plans to gradually decentralize the program, along with the rest of the health system.

- **Incorporation of DPT/Hepatitis B into the National Program**

  The Ivorian government plans to incorporate Hepatitis B into the NIP. Due to the relatively high cost of the vaccine and insufficient funding in the NIP budget, these plans have been delayed. Future plans call for vaccinating all newborns against Hepatitis B, as well as continuing to immunize people in high-risk groups. The NIP had sufficient funding in 1998 to buy 37,000 vials of the combined DPT/Hepatitis B, which covered the area of Abidjan only. This analysis estimates the cost of the combined vaccine for the next five years, if administered to all newborns.

- **Increasing immunization coverage to 80 percent in all areas of the country**

  Although the overall coverage rate in the Côte d'Ivoire is improvingapproximately 60 percent of all the nation's children are fully immunized at 12 monthsthe NIP acknowledges that there are large differences in coverage rates by area and that a number of the poorer, more isolated, rural areas still have unacceptably low rates. For instance, in the northern region, immunization coverage rates are believed to be quite low. A major goal of the NIP in the next several years is therefore to increase the rate of fully immunized children to 80 percent in all districts by concentrating on those areas with low coverage. Because of a lack of data, it was not possible in this study to estimate the total additional costs to meet this objective. However, this report discusses possible strategies to reach this goal and data needed to estimate the additional cost required in Section 5.

- **Introduction of auto-destructible syringes**

  The NIP would like to introduce auto-destructible syringes into the program nationwide. Two types of auto-destructible syringes are currently available for purchase: regular disposable syringes, which require proper disposal, and auto-destructible syringes, in which the needle cannot be drawn out again after use. Cost projections for both of these types of syringes are presented in this study.

2. Study Methodology

2.1 Research Questions

The main research questions that this case study will attempt to answer are the following:

- Costs
  - What are the annual costs of the current National Immunization Program in Côte d'Ivoire, including both recurrent and capital costs?
  - What are the costs of the National Immunization Days vs. the routine program costs?
  - What are the projected costs of the program for the next five years, including the additional costs of each innovation and change being considered (e.g., introduction of Hepatitis B, renewing and maintaining the cold chain, and introducing auto-destructible syringes)?
  - What are areas for possible cost savings and what degree of cost savings is possible?
- Financing
  - What is the mix of financing strategies that the country has been using to fund immunization services and the procurement of vaccines?
  - How successful have each of these strategies been in terms of: securing sufficient funding for immunization services as a whole, and for key components such as vaccines, cold chain, outreach, refresher training, and personnel? Maintaining or increasing coverage? Preventing inequities in coverage (e.g., between urban and rural areas)? Maintaining or increasing the quality of the vaccines and the program? Mobilizing new resources for the national program? Encouraging efficient use of resources (e.g., minimizing wastage)?
  - How successful has utilizing the open market been for Côte d'Ivoire in meeting the country's vaccine needs?
  - How do immunization financing strategies compare with the strategies used for all other health services? Is Côte d'Ivoire using the full range of financing strategies available in the country's health system? If not, why not?
- Financing for the Future
  - What are the projected needs for the next five years to finance the current program as well as the addition of new vaccines and other innovations and changes being considered? What is the projected funding available for the next five years and the projected funding gap?
  - How can Côte d'Ivoire improve upon the current financing strategies and the mix of strategies being used for immunizations in order to be able to develop sustainable financing for the NIP, including other planned changes?

- What are appropriate financing mechanisms for the planned improvements and changes? Can they be funded under existing strategies and funding sources or must new strategies be developed?
- What are the findings from other countries with similar economic, health financing, and immunization program circumstances?

2.2 Methodology

2.2.1 Data Collection Process and Data Sources

The data collection process for this analysis involved a PHR team visit to the Côte d'Ivoire. The team included two health economists and a research assistant as well as the regional health adviser from the WHO office in Abidjan. The team was reinforced through the assistance of a local consultant. In addition, this team benefited from the contributions of the executive director of the NIP and the MOH team.

The team gathered a large number of documents and secondary data which detailed national health budgets, financing activities, the roles of international organizations, evaluations of the NIP, epidemiological analyses that described coverage rates and a variety of other health and economic statistics. The Ministry of Health, Ministry of Finance, WHO, UNICEF, JICA, KFW, the World Bank, NGOs, and other national institutes of research prepared these documents. Information was also gathered at the local and regional levels. Discussions with NIP personnel and local experts at the central and regional level, directors of the programs of health, and representatives of private and public suppliers of health services were also utilized. In addition, local visits were conducted in three districts. The objectives of the local visits were to support, verify, and enrich the data available at the central level and to provide a more complete idea of the realities of immunization activities at the local level.

2.2.2 Costing Methodology

The aim of the national-level cost analysis is to estimate the costs of the Côte d'Ivoire's immunization program. Since this is a national-level analysis, user-level costs, such as travel costs to a health facility, are not considered as part of the analysis. The case study concentrates instead on what the Ministry of Health and external donors (i.e., UNICEF, WHO, etc.) currently spend, and will need to spend in the future, to provide immunization services, taking into account quality of services and coverage objectives. The costs of resources provided by the government from sectors (i.e., teachers) other than health have been considered only for the NID cost analysis. There may be additional inputs in to the immunization program (i.e., community organization of immunization activities) that are not included in the analysis since these costs are not borne by the government.

The cost estimation is based on existing data provided by the government and the multiple external donors involved in the NIP. The level of precision of the analysis could be improved if it were possible to collect primary data. This cost exercise combines information on expenditures, budget allocations, and cost in order to approximate the total annual costs of the NIP. It should be noted, however, that expenditures specifically related to immunization activities were difficult to identify within budget line items from the MOH. The costs of donated items were included whenever documented amounts and costs were available. More details on the costing methodology are provided in Section 3.

2.2.3 Description of Variables

Recurrent Costs

Recurrent costs are expenses associated with inputs that will be consumed or replaced in one year or less. For the purpose of this case study, it is the annual recurrent costs that are of most interest to the program, in terms of financial planning. Throughout the cost analysis, an exchange rate of US$ 1 = FCFA 600 is used.

- **Personnel**: salaries and benefits of staff involved in the management and provision of immunization services. This includes, at service delivery points, nurses and midwives who actually administer the vaccinations and physicians who play a minor role in supervising the nurses. At the local level, there are dedicated NIP coordinators who are involved with all aspects of NIP program management and operations. Central-level NIP management salaries are also included.

- **Vaccines:** costs of vaccines based on reported stock deliveries, usage, and calculated wastage. Information on actual expenditures for vaccines in 1998 was obtained from the INHP and PSP for vaccines purchased through the open market.

- **Supplies:** items such as needles, syringes, information, education, and communication (IEC) materials, parts for sterilization and cold chain equipment, vaccination cards, registers, and ice packs.

- **Transport**: maintenance and fuel involved with vehicle use by the Ministry of Health for the delivery of immunization services.

- **Maintenance and Overhead:** overhead costs, such as electricity, water, and maintenance of cold chain equipment.

- **Short-term Training**: short-term, in-service training for NIP activities for any type of health staff.

Capital Costs

Capital costs are the annual costs of resources that have a useful life of more than one year. These items~~fac~~ility buildings, equipment, etc.~~are~~ not consumed or replaced every year. The purchase cost of capital goods (also called capital investment) is distributed across the estimated useful life of the investment item, taking into account the discount factor which indicates the opportunity cost of having money tied up in capital. For the purpose of this cost analysis, a discount factor of 5 percent was used, based on discussions with the MOH and recommended cost analysis conventions (Brenzel and Claquin, 1994; Brenzel, 1991; Creese and Parker, 1994).

- **Buildings:** allocation of the value of the share of facility space devoted to immunization activities, based on the estimated replacement value of the primary health care facilities at which immunization activities take place.

- **Equipment:** cold chain and sterilizing equipment purchased by the NIP.

- **Vehicles:** type and numbers of vehicles used by the Ministry of Health for immunization activities.

- **Education/Training:** medium-term (longer than one year) training to personnel for vaccination training, supervision, and surveillance.

2.2.4 Calculating Future Vaccine Needs

Vaccine needs for the next five years were estimated using the population-based method. Target populations were estimated using the official global projected figures from the last census and demographic indicators (crude birth rate, infant mortality rate). Since BCG is given to newborn children, the number of live children born during the year was used as the target population. For the other antigens, the average population for children under one was calculated, taking into account infant mortality rates.

Estimates of immunization wastage rates were calculated by antigen using vials disbursed and the number of doses administered in 1998. The desired coverage rate was assumed to be 80 percent for the current vaccine needs analysis. To calculate future vaccine needs the current vaccination schedule and policy is assumed.

2.2.5 Financing Analysis Methods

Estimated costs, not expenditures, are used as a basis for the financing analysis. This allows accounting for all resources to the program, several of which would not appear in expenditure reports, including costs of the use of capital goods. Since the cost analysis required a number of assumptions, the same cautions that apply to the cost analysis should be taken in interpreting the results of the financial analysis.

Three types of costs for the financing analysis are calculated. The first is the *total estimated costs* of running the NIP, regardless of who bears these costs. Total costs include the proportion of capital costs used for health services~~he~~alth facilities, government vehicles, equipment, etc.~~th~~at are estimated to be used for immunization services, as well as the estimated cost of health personnel that go towards providing immunization services. The total cost analysis presents a picture of what funding sources are contributing to the national immunization program and to each cost category.

The second type of cost estimate includes the "*program-specific*" *costs* of the immunization program. These include only the costs that are incurred specifically for the delivery of immunization services, over and above the costs shared with other health activities, and regardless of who pays for them. Program-specific costs include all recurrent variable costs required to provide immunization services, such as vaccines; syringes, needles, and other vaccine supplies; transportation (i.e., fuel and porter) costs for both the NIDs and routine services; maintenance and overhead costs; and IEC/social mobilization costs that are related to the immunization program. Also included are the cost of immunization-related equipment, that is, cold chain and sterilization equipment. Program-specific costs exclude health personnel costs and capital costs, because these costs are shared with other MOH programs and would be incurred by the MOH with or without the immunization program.

Program-specific costs are useful to MOH and NIP program managers in determining exact costs of existing immunization services and of proposed program changes, such as how to eventually

replace the NIDs and who will bear these costs. For the analysis of current financing of the program (Section 4*),* the financing picture is presented both in terms of *total costs* and *program-specific costs*.

A third set of costs~~*re*~~*current, variable, non-personnel costs*~~are~~ the costs that the MOH must mobilize each year for the NIP, either from the ministry budget or from donors. These cost estimates are most useful to the MOH in planning the financing of the NIP. They include vaccines, syringes and other supplies, and other recurrent costs such as maintenance, transportation costs incurred by the MOH, IEC, and short-term training. They exclude personnel costs, since health personnel giving immunizations are shared with other health programs. They also exclude equipment costs, since they do not constitute regular operating costs that the government must pay for each year.[2] In this analysis, these costs are used as the basis for estimating the additional costs of, and financing required for future planned improvements, such as improving the cold chain as well as for the possible future financing scenarios presented in Section 5.

2.2.6 Study Constraints and Limitations

Limited data on the contribution of non-MOH financing sources for immunizations, such as private sector contributions, particularly for the NIDs, did not allow them to be included in the analysis. In addition, the lack of local level data on population size did not allow more detailed vaccine needs projections to be conducted.

Visits to Abidjan by study researchers coincided with investigations made by the European Union (EU) and other organizations on the financial situation of the MOH and other institutions. This prevented meetings with certain MOH senior managers.

Data limitations and the fact that plans are still being developed also made it impossible to provide meaningful cost projections for some of the planned additions and changes to the national immunization program.

[2] However, they do include costs of maintaining and operating equipment.

3. Current Costs of the National Immunization Program

This section estimates both the *total estimated costs* of the Côte d'Ivoire National Immunization Program for 1998 as well as the *recurrent, variable, non-personnel costs* to the Ministry of Health that are used as the basis for the cost and financing projections shown in Section 5.

The total estimated costs are separated into capital and recurrent costs. As explained in Section 2, capital costs are the annual costs of resources that have a useful life of more than one year; they include the use of building space and vehicles for immunization services, and cold chain and other immunization-related equipment. Recurrent costs are the costs of inputs, such as vaccines, supplies, maintenance, and transportation that are consumed or replaced in one year or less.

The analysis of total estimated costs includes both variable costs and fixed costs. Variable costs are those that change as the volume of service changes. They include vaccines, supplies, transport, cold chain equipment, and short-term training. In Côte d'Ivoire they also include those costs that are expected to change as the NIP undertakes new strategies for increasing coverage and for improving the quality of services, such as expanding the range of available vaccines and introducing new technologies.

Fixed costs are costs that remain the same regardless of changes in the program or in the volume of immunization services. The fixed costs in this analysis are the costs of the space in health facilities used for immunization activities, the cost of personnel who deliver immunization services (mainly nurses and health assistants), and the cost of vehicles used to deliver vaccines. These costs are considered fixed, since the number of personnel delivering immunization services or the number of vehicles used for NIP-related activities is not likely to change in the short run.

This analysis estimates the costs of both the "routine" immunization program and the additional costs of the National Immunization Days. The former involves the routine delivery of immunization services at health centers and through outreach activities, as well as other regular immunization activities such as mobile visits by the district NIP team. NIDs are semi-annual, three-day campaigns to immunize primarily against polio. The costs of the NIDs are included in this study, because the MOH wants to better understand their costs. The MOH is particularly interested in knowing how cost-effective these campaigns are, since they play a major role in the campaign to increase polio coverage rates. The sum of the costs of the routine program and those of the NIDs yields the total estimated cost of the NIP.

3.1 Total Estimated Annual Costs of the National Immunization Program

3.1.1 Total Estimated Costs of the Routine Program

The following discussion uses estimated costs for 1998 to represent the annual cost of the Côte d'Ivoire routine immunization program. The current costs of the routine program consist of both the recurrent costs and capital costs.

3.1.1.1 Recurrent Costs

As explained above, the recurrent costs of the NIP include the cost of personnel, vaccines, transport costs, supplies, short-term training of health personnel related to immunizations, social mobilization activities, and maintenance and overhead. Below is a brief description of how this study estimated each of these costs.

The estimate of personnel costs is based on approximations of the amount of time that health staff spends on immunization activities. These approximations are based on discussions with NIP central-level managers, district-level NIP coordinators, health staff, and other local experts working in immunization. The doctors posted at the primary health care level who are involved with immunization activities were estimated to spend 7 percent of their total time on immunizations, mainly for supervision of nurses' activities. The nurses who actually deliver vaccinations were estimated to spend 35 percent of their total time on immunization activities, and midwives were estimated to spend 23 percent of their time on immunization activities. The estimate also includes the district-level NIP coordinators, who spend 100 percent of their time on NIP activities. Central-level staff time, including NIP program staff, is also included. Salary information from 1998 was obtained from interviews with NIP personnel and a report by the KFW (Schonhals 1995). The total estimated cost of personnel per year is US$ 5.13 million for the routine program, or approximately FCFA 4 billion.

Vaccine cost estimates are based on the actual number of doses delivered in 1998 through routine program channels. Vaccine prices for 1998 were obtained through the INHP and PSP. This method most closely reflects the true cost of vaccines, since it represents the amount of vaccine actually consumed, whether by recipients or by wastage. However, it is important to remember that this estimate is based on actual usage, not purchases of vaccines. The total estimated cost of vaccines for the routine program in 1998 was US$ 1,224,221.

Transport costs include the cost of fuel and maintenance of vehicles used for immunization activities. Data on fuel and vehicle maintenance are not available from the Ministry of Health. For this study to have made an independent estimate would have required manually tabulating past individual requisitions for the use of government vehicles at the national and local level and then allocating these requisitions to immunization activities. This was beyond the data collection scope of this study. Therefore, the study bases its estimates on Schonhals (1995). The total estimated transportation cost for the routine program obtained using this method is US$ 130,777.

The supplies category includes items such as needles, syringes, IEC materials, parts for sterilization and cold chain equipment, vaccination cards, registers, and ice packs. These cost data for 1998 were obtained from the PSP and the INHP. The total estimated cost per year is US$ 344,854.

Short-term training includes periodic refresher training for health personnel related to immunization service delivery. Interviews with NIP managers and review of the budgets showed that training does not take place every year, but only when there is a new aspect added to the program, in which case the training is usually arranged and provided by a donor organization. A WHO estimate of short-term training costs was based on past patterns and cost levels. The total estimated cost per year is US$ 27,821.

Maintenance and overhead includes maintenance of the cold chain equipment, which is estimated at 2 percent of the annualized costs of major cold chain equipment (freezers and refrigerators only, not vaccine carriers). The annual electricity expenditures made by the MOH at primary care facilities is also included in maintenance costs. Electricity costs are based on the number

of major cold chain items (cold room, refrigerators) and the equipment's typical consumption of kilowatts per year. The total estimated cost is US$ 172,756 per year.

3.1.1.2 Capital Costs

Capital costs of the immunization program consist of the cost of the space in health facilities allocated for immunization services; the cost of cold chain equipment, including cold rooms, refrigerators and freezers; and the cost of vehicles used for immunization activities.

The estimated annualized cost of building space allocated for immunization services is based on a price derived from the actual expenditures in the MOH budget for the construction of all new facilities where immunization activities take place (i.e., rural dispensaries, rural health centers, urban health centers, and rural and urban hospitals). The estimates of space allocated towards immunization activities for each type of health facility were derived from recommended minimum sizes of primary health care facilities, per the MOH, and input from NIP managers. The total estimated annualized cost of building space for immunizations is US$ 556,663 when using a 5 percent discount rate.

Equipment costs include cold chain equipment. Cold chain equipment consists of the central cold rooms, major equipment such as different types of refrigerators and freezers, and cold boxes and vaccine carriers. The estimates consider only equipment that is less than five years old, using the original purchase prices from 1998 invoices. Data on the equipment types, numbers, and age were obtained from the 1999 cold chain inventory.[3] The total estimated annualized cost of equipment comes to US$ 182,474.

An estimate of the annual costs of vehicles was made based on an estimation of the number and type of vehicles used by the MOH and an estimate of the percentage of time that these vehicles are used for immunization activities. The total estimated annualized cost of vehicles for the immunization program is US$ 69,823.

3.1.1.3 Total Annual Costs of the Routine Program

The estimated cost of the routine program for 1998 are shown in Table 7. The total annual cost is US$ 7.9 million. Recurrent costs account for 90 percent of the total and capital costs make up 10 percent. Personnel is by far the largest cost category, accounting for 65.1 percent of program costs. Vaccines account for 15.5 percent.

[3] It should be noted that external donors such as JICA and KFW have donated most of the cold chain equipment. The inventory was carried out by the Management Commission of NIP Equipment, April 1999.

Table 7. Total Estimated Annual Costs of the Routine Immunization Program, 1998

Cost Component	US$	% of Total
Recurrent Costs		
Personnel	5,130,535	65.1
Vaccines	1,224,221	15.5
Supplies	344,854	4.4
Transportation	130,777	1.7
Short-term Training	27,821	0.4
IEC/social mobilization	37,017	0.5
Maintenance and overhead	172,756	2.2
Subtotal	$7,067,981	89.7%
Capital Costs		
Building space	556,663	7.1
Vehicles	69,823	0.9
Equipment	182,474	2.3
Subtotal	$808,960	10.3
Total Annual Costs	$7,876,941	100%

3.1.2 Costs of the National Immunization Days

As mentioned above, many different sectors become involved in the NIDs, including educators and NGOs. In addition, a number of international donors, such as Rotary International, USAID, JICA, KFW, WHO, and UNICEF have contributed materials, vaccines, and money over the years. Since many resources come from outside of the NIP, and are provided free and often on an *ad hoc* basis, it is difficult to fully cost out the NIDs. However, in planning for the NIDs every year, the NIP maintains action plans for inputs that will be needed to reach program targets, and divides some of these inputs according to health sources (from the MOH budget) and non-health sources (from other government budgets). Based on these annual NID plans and the performance reports for the NIDs for the past two years, the study was able to estimate the annual costs of the NIDs for 1998.

For personnel costs (physicians, nurses, and midwives), it was estimated that two days are used for planning the NIDs, which are then carried out in two rounds that last three days each. During the actual vaccination days, some health personnel who do not normally get involved with immunization activities contribute their time, especially physicians and nurses. According to NIP coordinators, province-level health directors and several nurses continue to provide health services during the NIDs, but to a lesser extent than usual. Non-health government employees involved in the NIDs are mostly support staff, such as drivers. Without an in-depth study of personnel time distribution for both routine and NID immunization activities, personnel costs were based on informal input from local immunization experts. Only the value of the time that health staff spend in addition to their time on routine immunization activities are included in the calculation of personnel costs for the NIDs. The estimated cost of personnel is US$ 661,844 per year.

Vaccine costs were based on WHO estimates of the number of doses (polio only) distributed for the 1998 NIDs, and the PSP-INHP 1998 price per vial, and average wastage rates observed during the NIDs for 1998. The estimated cost of vaccines, which were purchased by UNICEF, is US$ 611,883.

Transportation costs were estimated based on the MOH budget allocation for transportation during NIDs as well as estimates of non-health sector vehicle utilization for the NIDs (personnel communication from local immunization experts). The estimated cost of transportation is US$ 119,018.

Short-term training refers to NID-related training for health personnel and volunteers. This study uses the WHO estimate of short-term training costs for 1998 NIDs. The estimated cost is US$ 19,929.

The estimated cost of social mobilization for the NIDs, which is a key to their success, includes only the costs of mobilization activities performed by health personnel, and the value of donations to the health/NIP budget from international organizations specifically for these activities. The contribution to social mobilization activities by sectors outside of health, such as schoolteachers, NGOs, and others, could not be estimated due to a lack of data. The estimated cost per year is US$ 228,480.

Maintenance and overhead includes cold chain equipment, monitoring and evaluation, and cold chain transit. The estimated cost per year is US$ 42,853.

Additional facilities are used to deliver immunizations during the NIDs. However, there is no information available on the parameters for distributing these overhead costs and on the additional overhead costs. Therefore, these inputs are not included in the cost estimate of the NIDs.

Keeping these data limitations in mind, the estimated additional cost of the NIDs~~ov~~er and above the cost of the routine program~~for~~ 1998 is shown in Table 8, by health sector and non-health sector costs The annual cost is nearly US$ 1.7 million. As with the routine program costs, personnel is the largest cost component, accounting for 39.4 percent of the total. As expected, vaccines account for a larger proportion of the total NID cost (36 percent) than they do for the routine program (15.5 percent). Together, personnel and vaccines account for almost 75 percent of the total NID cost. Transportation costs are also proportionally greater for the NIDs (7 percent) than for the routine program (1.7 percent). Again, it must be kept in mind that the personnel and social mobilization inputs from non-health sources are underestimated, and that non-health overhead costs are not included, all of which affects the percentage of the total cost that each cost component makes up.

Comparing the contributions of the health sector and other sectors, these estimates show that more than 90 percent of the total NID costs are borne by the health sector and less than 10 percent by other sectors, though, again, the non-health sector contributions for social mobilization are not included in this estimate. Non-health sectors make a significant contribution in terms of personnel—paying for at least 20 percent of these costs. This is important when considering the financing and sustainability of the NIDs as a strategy to improve and/or maintain high immunization coverage.

Table 8. Estimated Annual Costs of the National Immunization Days, 1998

Cost Component	Costs of Health Sector Inputs		Costs of Non-Health Sector Inputs		Total Costs	
	Amount (US$)	%	Amount (US$)	%	Amount (US$)	%
Personnel	526,844	34.1	135,000	98.0	661,844	39.4
Vaccines	611,883	39.6	0	0.0	611,883	36.4
Transport	116,299	7.4	2,719	2.0	119,018	6.9
Training	19,929	1.3	0	0.0	19,929	1.2
IEC/social mobilization	228,480	14.8	0	0.0	228,480	13.6
Maintenance/overhead	42,853	2.8	0	0.0	42,853	2.5
TOTAL	$1,546,288	91.8%	$137,719	8.2%	$1,684,007	100.0%

Source: NIP Administration; MOH

3.1.3 Total Estimated Costs of the NIP

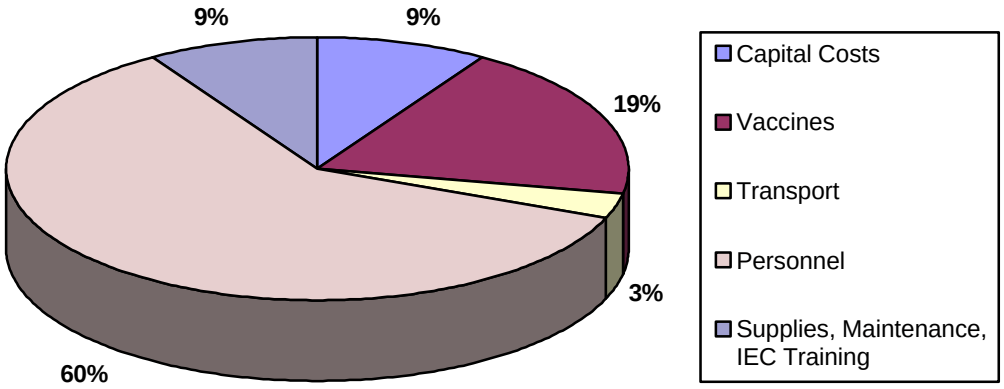
The total estimated annual costs of the NIP, broken down by costs for both the routine activities and the National Immunization Days are shown in Table 9. The table shows that the total estimated cost of the program per year is US$ 9.5 million (approximately FCFA 5.7 billion). Recurrent costs, such as personnel, vaccines, and transportation, are US$ 8.7 million, or 91.5 percent of the total estimated costs. Approximately US$ 808,960 or 8.5 percent of the total, are capital costs, including building space cold chain and other equipment. The largest cost item is personnel, which accounts for 60.6 percent of total costs, and vaccines, which account for 19.2 percent. Cold chain and other equipment make up only approximately 2 percent of total program costs. The percentage breakdown by cost category is also shown in Figure 5.

Table 9. Total Estimated Costs of the National Immunization Program, 1998

Cost Component	Routine Program Costs (US$)	NID Costs (US$)	Total Program Costs (US$)	% of Total
Recurrent Costs				
Personnel	5,130,535	661,844	5,792,379	60.6%
Vaccines	1,224,221	611,883	1,836,104	19.2%
Supplies*	344,854	0	344,854	3.6%
Transportation	130,777	119,018	249,795	2.6%
Short-term training	27,821	19,929	47,750	0.5%
IEC/social mobilization	37,017	228,480	265,497	2.8%
Maintenance/overhead	172,756	42,853	215,609	2.3%
Subtotal	$7,067,981	$1,684,007	$8,751,988	91.5%
Capital Costs				
Building Space	556,663	0	556,663	6%
Vehicles	69,823	0	69,823	0.5%
Equipment	182,474	0	182,474	2%
Subtotal	$808,960	0	$808,960	8.5%
TOTAL	$7,876,941	$1,684,007	$9,560,948	100.0%
Percent of Total Costs	82%	18%	100.0%	

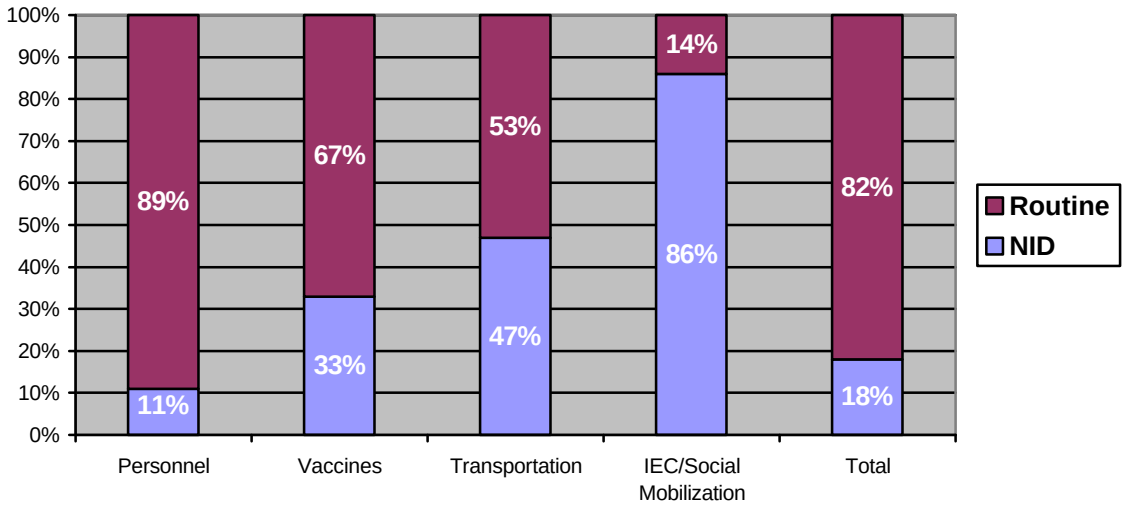
*The value of supplies is zero for the NIDs since syringes are not used with the oral polio vaccine.

Figure 5. Total Immunization Cost Breakdown



The cost of NIDs represents 18 percent of the total NIP cost. The majority of this is for personnel, vaccines, and transportation. As shown in Figure 6, almost 11.4 percent of all personnel costs are spent on the NIDs, though this includes the 20.4 percent of total NID personnel costs contributed by non-health sectors. Thirty-three percent of all vaccine costs are consumed during the NIDs. Nearly 47 percent of transportation costs are also used during the NIDs, which involve extensive outreach activities throughout the country. Most IEC and social mobilization costs (approximately 86 percent) are also related to the NIDs. Again, it must be kept in mind that certain NID-related costs, especially personnel and social mobilization from non-health sectors, are underestimated, and thus the actual cost of the NIDs and its proportion of the total cost of the immunization program are higher than these figures indicate.

Figure 6. Breakdown of Total Program Costs by Routine Immunization Activities and NIDs by Selected Components, 1998



3.2 Program-specific Costs

The *program-specific costs* of the immunization program include only the costs that are incurred specifically for the delivery of immunization services, over and above the costs shared with other health activities and regardless of who pays for them. Thus, NIP program-specific costs exclude health personnel costs and capital costs, such as space in health facilities, and government vehicles, since these costs are shared with other MOH programs and would be incurred by the MOH with or without the immunization program. Program-specific costs include all recurrent variable costs required to provide immunization services, such as vaccines; syringes, needles and other vaccine supplies; transportation (i.e., fuel and porter) costs for both the NIDs and routine services; maintenance and overhead costs; and IEC/social mobilization costs that are related to the immunization program. Also included are the cost of immunization-related equipment, that is, cold chain and sterilization equipment. Table 10 presents program-specific costs, broken out by routine and NID costs.

Program-specific costs are useful to MOH and NIP program managers in determining exactly what it costs specifically to provide immunization services and in planning program changes, such as how to eventually replace the NIDs and who will bear these costs. For the analysis of current financing of the program (Section 4), the financing picture is presented both in terms of *total costs* and *program-specific costs*.

In looking at the proportion of total program-specific costs, capital costs represent only 7.9 percent. More than 92 percent is spent on recurrent costs, including over 57 percent on vaccines, 11 percent on supplies, and 8 percent on IEC and social mobilization.

Table 10. Total Estimated Program-specific Costs of the National Immunization Program, 1998

Cost Component	Routine Program Costs (US$)	NID Costs (US$)	Total Program Costs (US$)	% of Total
Recurrent Costs				
Vaccines	1,224,221	611,883	1,836,104	57.21
Supplies*	344,854	0	344,854	10.74
Transportation	130,777	119,018	249,795	7.70
Short-term Training	27,821	19,929	47,750	1.50
IEC/social mobilization	37,017	228,480	265,497	8.27
Maintenance/overhead	172,756	42,853	215,609	6.72
Subtotal	$ 1,937,446	$1,022,163	$2,959,609	92.14%
Capital Costs				
Vehicles	69,823	0	69,823	2.17
Equipment	182,474	0	182,474	5.69
Subtotal	$252,297	0	$252,297	7.86%
TOTAL	$ 2,189,743	$1,022,163	$3,211,906	100.0%
Percent of Total Costs	68.23%	31.77%	100.0%	

*The value of supplies is zero for the NIDs since syringes are not used with the oral polio vaccine.

3.3 Current Recurrent Variable Non-Personnel Costs

The recurrent variable non-personnel costs of the immunization program for 1998, used as the baseline for the cost and financing projections for the program in the future (Section 5), are shown in Table 11 and in Figure 7. These include the cost of the routine program and the national immunization days, as explained at the beginning of this section.

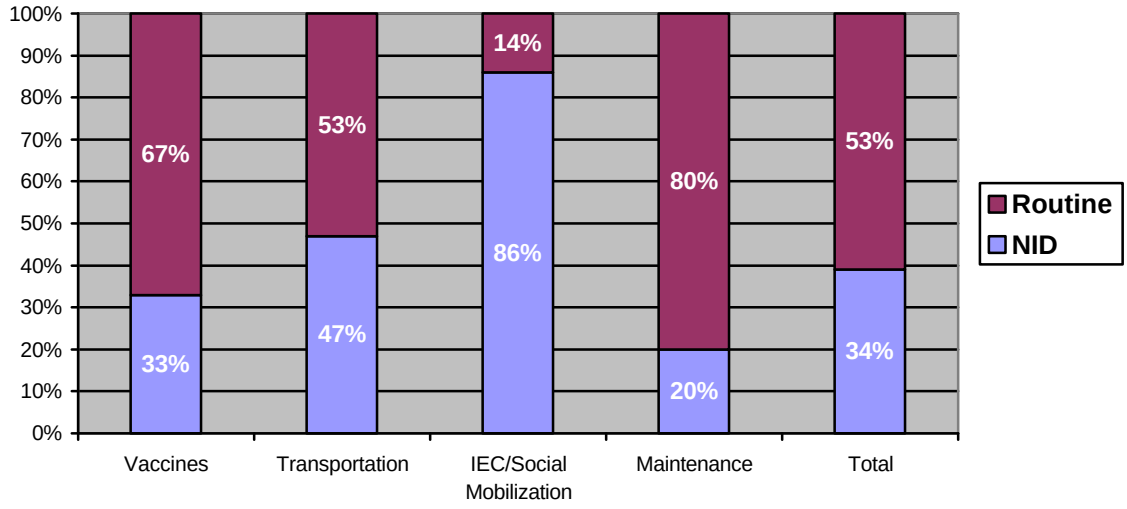
Table 11. Estimated Recurrent Variable Non-personnel Costs of the Immunization Program, 1998

Cost Component	Routine Program (US$)	%	NIDs (US$)	%	NIP (US$)	%
Vaccines	1,224,221	63.2	611,883	60.0	1,836,104	62.1
Supplies	344,854	17.8	—	0.0	344,854	11.7
Transportation	130,777	6.7	119,018	11.4	249,795	8.4
Short-term training	27,821	1.4	19,929	2.0	47,750	1.6
IEC/Social mobilization	37,017	1.9	228,480	22.4	265,497	9.0
Maintenance/Overhead	172,756	8.9	42,853	4.2	215,609	7.3
TOTAL	$1,937,446	100.0%	$1,022,163	100.0%	$2,959,609	100.0%

* Transportation costs are those of the routine program and of health sector contributions to the NIDs. They do not include transportation provided by the non-health sector.

These data showed that vaccines make up 62 percent of recurrent variable non-personnel costs of the program. Vaccine supplies such as needles and syringes make up 11.7 percent, and transportation costs borne by the MOH are 8.4 percent. Social mobilization costs account for another 9.0 percent (although the social mobilization costs of the NIDs are likely underestimated, as explained above). These data highlight the dominance of vaccines in the recurrent program costs for which the MOH must find financing each year.

Figure 7. Breakdown of Recurrent Variable Non-Personnel Costs by Component



3.4 Cost-effectiveness Estimates for the National Immunization Program

Using the immunization cost estimates, the study obtained estimates for the standard cost-effectiveness measures used for immunizations, including cost-per-dose administered, cost per fully immunized child (FIC), and cost per capita. These estimates are shown in Table 12. The overall cost-per-dose of the program is estimated at US$ 0.41. This compares to a cost-per-dose estimate of US$ 0.56 found in a recent study in Bangladesh (Levin et al., 1999) and US$ 0.77 in Morocco (Kaddar et al., 1999). The cost-per-dose delivered during the NIDs was found to be less than half of that estimated for the routine program (US$ 0.21 vs. US$ 0.51), which suggests greater efficiency of the NIDs as a vaccine delivery strategy. This is counterintuitive to the higher cost per FIC for campaigns found in other studies. Some of this may be due to the underestimation of social mobilization costs, both in terms of health and non-health contributions, and the underestimation of non-health personnel costs. A prospective study of NIDs in China (Jiatong, 1998), for instance, found that "publicity" accounted for 31 percent of the total costs of the NIDs, whereas social mobilization in this study was found to contribute only 2 percent of total NID costs. The overall cost of the program per capita was estimated at US$ 0.61.

Table 12. Cost-Effectiveness Estimates for the National Immunization Program, 1998

Measure	Output	Cost-effectiveness Ratio (US$)
Number of doses administered		
During routine activities	15,322,840	$0.51 per dose
During NIDs	7,890,000	$0.21 per dose
Total	23,212,840	$0.41 per dose
Children fully immunized by age 12 months (FIC)*	394,740	$24.29 per FIC
Per capita cost of immunizations	15,695,251	$0.61 per capita

Source: NIP
*FIC was calculated by dividing total program costs by the population of children under 1 multiplied by the DPT 3 coverage rate.

Table 13. Cost Comparisons for Morocco, Bangladesh, and Côte d'Ivoire

Countries	Morocco	Bangladesh	Côte d'Ivoire
Costs per dose	$0.77	$0.56	$0.41
Children fully-immunized by age 12 months (FIC)*	$20.89	$23.39	$24.29

Source: NIP
*FIC was calculated by dividing total program costs by the population of children under 1 multiplied by the DPT 3 coverage rate.

To obtain estimates of cost per fully-immunized child, administrative reports of the number of children fully immunized before 12 months of age were used to approximate FIC.[4] The cost per FIC obtained was US$ 24.29. These estimates are somewhat high compared to estimates obtained in other countries, US$ 20.89 in Morocco (Kaddar et al., 1999) and US$ 23.39 in Bangladesh (Levin et al., 1999). Studies conducted during the 1980s found a range from US$ 5 to US$ 15 per FIC; later studies

[4] While the weaknesses of using administrative reports for this type of evaluation are well recognized, an absence of survey data necessitated their use; as such, the results should be interpreted with caution.

done find a range from US$ 10 to US$ 20 (Brenzel and Claquin, 1994; Brenzel, 1991; DeRoeck and Levin, 1998).

3.5 Vaccine Procurement and Prices

Côte d'Ivoire is unusual among sub-Saharan African countries because of its use of a local vaccine procurement system and purchasing directly through the market without passing through the UNICEF procurement mechanism. What are the characteristics of this system? What are the results? How has it evolved?

3.5.1 Organization of Vaccine Procurement

Vaccines are procured via three sub-systems: the commercial private sector, the INHP, and, for the oral polio vaccine, through UNICEF.

- The commercial private sector, which includes wholesale suppliers and pharmacies, is entirely dominated by wholesalers (Laborex, GOMPCI, etc.) and obeys the rules and regulations of the pharmaceutical sector. It imports at least 20 vaccines, a greater range than that available at the INHP. A number of these vaccines are not implemented in the national vaccination schedule (see Annex A). The prices of vaccines sold by wholesale suppliers and pharmacies are significantly more than those available at the INHP.

- The INHP, which has a double circuit, one for NIP vaccines administered free of charge in the public health centers and the other for vaccines administered by the INHP with compensation from businesses, travelers, and certain population groups (pilgrims, students, salaried). The executive director of the NIP coordinates with the INHP to determine the vaccine needs for the program. The INHP presents its request to the PSP, taking into account the budget, available stocks, and desired delivery.

- A third sub-system exists for the oral polio vaccine, which is imported by UNICEF and managed by the minister of health through the INHP. The INHP and NIP director determine the volume of OPV to import through UNICEF/Copenhagen. In general, the OPV is imported for NIDs and is financed by donors. In the last few years, JICA and the U.S. Centers for Disease Control and Prevention (CDC)/USAID have been the principal donors. The INHP receives stocks and distributes vaccines according to needs and planned schedules.

Table 14. Summary of Vaccine Procurement

Sources of Procurement	UNICEF	Open International Market		Private European Laboratories
Who utilizes?	INHP	INHP		Pharmacies, clinics
Who imports?	UNICEF	PSP	PSP	Gross importers
For which vaccines?	Oral polio	NIP vaccines	Non-NIP vaccines	All vaccine brands
Who pays for the vaccines?	Donors: JICA, Rotary Intl., CDC/USAID	MOH budget	Clients	Users
Level of public prices?	Low	Low	Competitive	High
Who administers the vaccines?	Public services during NIDs	Public services	INHP services	Private pharmacies, doctors, nurses, private clinics
Who are the clients/users?	Target population	Public sector users	Salaries, students, travelers	Individuals, urban clientele
Payment by users?	Free vaccines for the population concerned	Free vaccines	Payment by individuals, businesses, societies	Direct payment by users

3.5.2 Differences in Services and Prices

The existence of this triple procurement circuit has numerous consequences in terms of vaccine availability, access, import pricing, and public prices. The study lacked information that would have allowed it to compare the three circuits in detail. Nevertheless, the following observations have been made:

- The purchasing and negotiating capacity of Cote d'Ivoire is split and segmented between the private sector (wholesalers, private pharmacies) and the public sector (PSP-INHP). Each circuit has a range of financing, suppliers, and clients. It is certain that similar vaccines are imported under diverse forms and combinations at different prices.

- There is access to vaccines according to the national policies (for NIP vaccines) and according to the ability to pay. Thus, the INHP, a public agency, offers a wider range of vaccines to those individuals or groups that are able to pay. The new vaccines are offered by the INHP in their public health structures and are available at a slightly higher price. These vaccines are less expensive in comparison to the private sector; however, some profit is sought when setting the price. Table 15 lists the prices at the INHP and the private sector pharmacy for one dose of each vaccine indicated. The price at the INHP includes the administration of the vaccine while the price at the private pharmacies does not. It would be necessary to add at least FCFA 500 in order to compare the two prices. It is possible to state that in general, the price in the private sector is at least three times as high as in public sector, as represented by the INHP.

Table 15. Price of One Dose at the INHP and in Private Pharmacies, 1999

Vaccine	Cost per Dose (US$)	
	INHP	Private Pharmacy*
Meningitis A+C	2.50	8.00
Tetanus	0.83	2.41
Hepatitis B	5.83	15.83
Yellow Fever	8.33	NA
BCG	NA	5.30
DPT3	NA	4.35
Measles	NA	7.92
Hib	8.33	15.83

* Does not include vaccine administration

- The differences in public sector prices indicate signs of great disparity in terms of import prices and the profit margin between the INHP and the private commercial sector. There is little doubt that the import prices obtained by the INHP through the PSP is much more competitive due to international bids and relative diversification among suppliers and grouped purchases.

- It is clear that utilizing the international tender and bid process by the PSP for the INHP account allows for improved negotiation of import prices on the international market even if the PSP has not explored all possibilities outside of European suppliers. The PSP began importing from Asia, however, for the moment, quantities are small. The lack of knowledge concerning all possible suppliers, the inability to find prices comparable to the UNICEF system, and the rigid aspects of the Ivoirian legislature (for example, the supplier must be registered in the country and must accept payments in francs) have constrained the diversification and competition between suppliers. Gains are possible if all options are explored and if a national authority with the capacity to control the biological products is established and becomes operational.

3.5.3 Cross-country Comparison

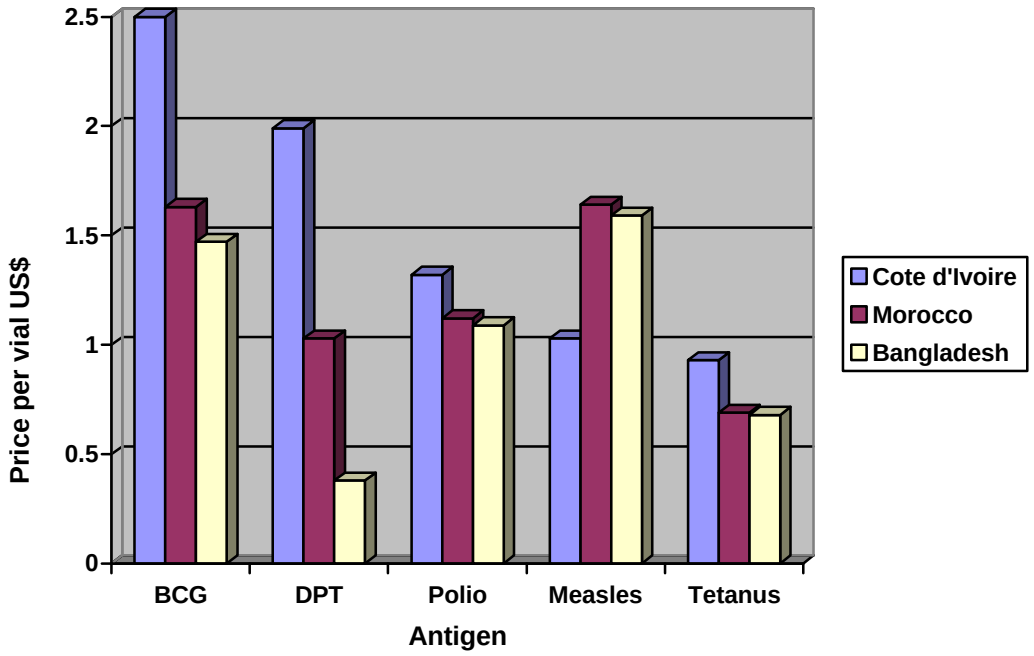
How do vaccine prices compare between the open market bidding process utilized by the Côte d'Ivoire and the UNICEF procurement system that Bangladesh and Morocco have adopted? The Côte d'Ivoire pays more for vaccines overall (US$ 7.11) than Morocco (US$ 6.11) and Bangladesh (US$ 5.81) (Table 16). The Côte d'Ivoire however, seems to negotiate better prices for the measles vaccines.

Table 16. Comparisons of Prices for Antigens: Côte d'Ivoire, Morocco, and Bangladesh, 1998

Antigen	Doses per vial	Côte d'Ivoire Cost per Vial (US$)	Morocco Cost per Vial (US$)	Bangladesh Cost per Vial (US$)	Price Difference for Côte d'Ivoire (US$)
BCG	20	2.50	1.63	1.47	+1.03-0.87
DPT	20	1.33	1.03	0.98	+0.35-0.30
Polio	20	1.32	1.12	1.09	+0.23-20
Measles	10	1.03	1.64	1.59	-0.61-.56
Tetanus	20	0.93	0.69	0.68	+0.25-0.24
Total Price	NA	$7.11	$6.11	$5.81	+$1.30-1.00

The price differences are shown in Figure 8.

Figure 8. Vaccine Price Comparisons



The difference for immunizing a child with these five antigens may seem minimal. However, if each of the countries were to immunize 500,000 children at these prices it would cost the Côte d'Ivoire US$ 3.55 million dollars, Morocco US$ 3.055 million, and Bangladesh US$ 2.9 million. Given the above scenario, the Côte d'Ivoire could save US$ 500,000 to US$ 650,000 per year by using the UNICEF procurement system.

4. Immunization Financing in Côte d'Ivoire: Description and Assessment

This section presents an assessment of immunization financing in the Côte d'Ivoire. It first examines trends in financing of the health sector as a whole, and then looks at the sources and trends in financing of the NIP. Finally it discusses implications on the adequacy of financing and sustainability.

4.1 Trends in Overall Health Financing

4.1.1 Government Budget Allocations

Health expenditures increased in the last decade (Table 17). As a percentage of the national budget, total health expenditures increased from 6 percent in 1987 to 8.7 percent in 1997. Health expenditures per capita increased from US$ 9.00 in 1995 to US$ 10.40 in 1997.

The health budget, excluding external grants, rose from approximately US$ 108 million in 1995 to US$ 168 million in 1997, an average annual increase of more than 28 percent. The health budget per capita was US$ 7.50 in 1995, US$ 8.20 in 1996 and US$ 9.00 in 1997, an annual increase of 6.2 percent. When external contributions are included, the health budget represented 1.3 percent of GDP from 1995 to 1997 and 7.2 percent of the national budget in 1995 and 1996.

Table 17. Trends in Health Sector Expenditures and Cost Recovery in 1995-1997

Principle Components	1995	1996	1997
Government health budget (US$ millions)			
Without external grants	$107.57	$120.0	$138.0
With external grants		$36.0	$30.0
Total health budget	$107.57	$156.0	$168.0
Health expenditures (US$ millions)			
Without external grants	$128.00	$141.0	$160.0
With external grants		$178.0	$190.0
Health budget per capita (US$)	$7.50	$8.2	$9.0
Health expenditures per capita (US$)	$9.00	$9.6	$10.4
Health budget as % of GDP*	1.3%	1.3%	1.3%
Health budget as % of government budget*	7.2%	7.2%	7.5%
Health expenditures as % of government budget*	8.6%	8.4%	8.7%

Source MOH, MOH 1997b
* Without external grants

The Ivoirian health system is strongly skewed toward tertiary-level care, to the neglect of the primary and secondary levels. Between 1987 and 1989, 50 percent of the provisional budgets were allocated to the tertiary level (Guimier, 1992), while the primary level never received more than 23 percent. Allocations to primary care increased steadily in the 1990s, reaching 33 percent in 1999. Nevertheless, hospitals continue to consume an enormous part of the budget despite their diminished activities and poor quality of care.

4.1.2 International Donor Funding

External grants for public health services represented approximately 24 percent of the MOH budget in 1996 and close to 18 percent in 1997. External financing of health expenditures appears in several forms and occurs from diverse sources:

- Direct contributions by NGOs without institutional coordination with the minister of health.
- Loans from development banks such as the World Bank, African Development Bank, and KFW. Despite the importance of these loans, there have been serious delays and problems associated with the transfer of funds and project execution. The KFW project and, more recently, the World Bank Program for the Development of Integrated Services (*Programme de Developpement des Services de Santé Integrés*), illustrate this issue: In three years, less than 20 percent of the allocated funds were consumed.
- Budgetary aid from the EU. This assistance is critical, because it finances recurrent non-personnel expenditures. In particular, the assistance is allocated to the PSP, to the essential drugs program, to blood transfusion services, and for the NIP.

Donor investment projects in health registered with the Public Investment Program in 1997-99 indicate that the total investment credits for that period were approximately US$ 230 million, with more than 50 percent for hospital services.

4.1.3 Household Health Expenditures and Cost Recovery

In 1991 the Côte d'Ivoire implemented a policy of partial cost recovery for some curative health services and drugs in select health care facilities. In the following years, the policy was expanded to include a greater number of services and drugs and, in 1994, the policy was extended to include all health care facilities. Currently, the cost recovery fund represents close to a quarter of the operating budget of the MOH (see Table 18) and it is an even greater source of revenue for certain health care establishments at the primary and secondary level. The total revenue generated from cost recovery in the years 1995-1997 was approximately US$ 20 million, with an average annual increase of 2.6 percent. The majority of this revenue (more than 80 percent) was generated from national public health establishments (MOH, 1999b) such as the INHP, PSP, and the Center for Blood Transfusions. Among health care facilities~~pri~~mary health care facilities, urban health centers, health specialty centers, and general hospitals including regional and university hospitals~~the~~ distribution of revenue varies by level and location. In 1997, 17.5 percent of total cost recovery was generated by primary health care facilities, 15.1 percent by general hospitals, and 67.4 percent by the university and regional hospitals. While annual per capita cost recovery was approximately US$ 1.50, this rate varies tremendously among regions due to the concentration of university hospitals in the two largest cities

Table 18. Trends in Health Sector Cost Recovery

Component	1995	1996	1997
Cost recovery (US$ millions)	$20.8	$20.0	$22.0
Cost recovery as % of health expenditure*	16.3%	14.4%	13.8%
Cost recovery as % of recurrent budget*	25.1%	23.4%	23.0%
Cost recovery per capita (US$)	$1.50	$1.40	$1.40

Source MOH, 1997b
* Without external grants

4.2 Sources of Immunization Financing

The government of Côte d'Ivoire in coordination with external partners has traditionally financed the NIP. Until the end of the 1980s, UNICEF was the principal financier of the NIP activities. The sources of financing for the NIP have altered with the introduction of the EU grant. An overview of the current NIP financing sources is described below.

4.2.1 Government Resources

The government of Côte d'Ivoire finances a large percentage of the NIP. This includes a significant amount of funding for personnel and building construction as well as for clinic records, fuel for travel related to supervisory visits, maintenance of vehicles and equipment, IEC and social mobilization, and so forth.[5] The government of Côte d'Ivoire also covers many of the immunization-specific costs, such as for vaccines and vaccine supplies. The financing of vaccines and vaccine supplies is separated into a specific line item in the operating budget because the financing comes from the EU. With this EU assistance, the NIP has progressively increased the amount allocated to vaccines and supplies from 1992 to the present as seen in Table 19 and Figure 9.

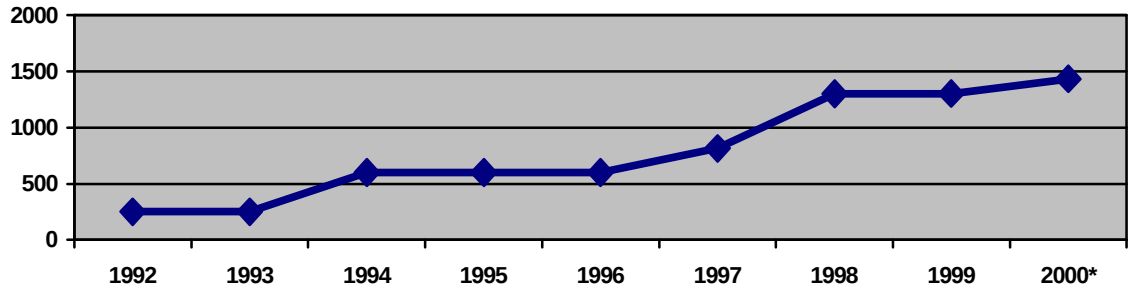
Table 19. Trends in Budget for Vaccine and Vaccine Supplies, 1993-2000 (US$)

Years	1993	1994	1995	1996	1997	1998	1999	2000
Amount	416,667	175,833	1,000,000	1,000,000	1,355,000	2,166,667	2,171,667	2,386,667

*Source including projections: DAF/MOH

[5] It is important to note that the budget for the maintenance of equipment and vehicles which are used for the supervision of vaccination activities and epidemiological surveillance is insufficient to ensure a satisfactory level of services. The IMF, the World Bank, and the EU particularly aggravated this situation in the last few years with the reduction of external assistance during polio eradication activities.

Figure 9. Trends in Budget for Vaccine and Supplies, 1992-2000 (FCFA millions)



4.2.2 International Donor Funding

Donors, including both bilateral and multilateral agencies, have provided critical support to the NIP over the years. As discussed above, EU budgetary assistance pays for routine vaccines and supplies. French Cooperation supported the implementation of a health information and management system, and with the collaboration of the GTZ, worked to strengthen the MOH central management capacities. The WHO played an important role in financing improvements to the national information system and in training local health personnel to improve the country's disease surveillance capacity, especially for acute flaccid paralysis under the polio eradication program. Donors also have provided items such as cold chain equipment, vehicles, social mobilization materials, and training.

Donor financing is particularly important for National Immunization Days. The polio vaccine used during the NIDs is provided for notably through contributions from JICA. Private donors have also contributed to the program. Rotary International has made several contributions of polio vaccine, and private pharmaceutical companies have donated free vaccines on an irregular basis. Other costs for NIDs are covered by various partners including, the CDC/USAID, WHO, UNICEF and AXA-assurances.

Some of the funds contributed to the polio eradication campaign were used to upgrade the cold chain and will provide long-term benefits to the NIP. The largest contribution, US$ 7.28 million, came from KFW. JICA contributed approximately US$ 1.7 million, which paid for several refrigerators, freezers, and cold boxes in 1998 (Table 20). Other donors of equipment and vehicles include WHO, UNICEF, and the Belgian Cooperation.

Table 20. Equipment Purchased for the Cold Chain in Côte d'Ivoire

Equipment	JICA	KFW
Refrigerator	0	89
Refrigerator-freezer	80	440
Portable freezers	561	0
Freezer	40	26
Vaccine boxes	3,538	2,109
Cold box	68	22
Refrigerator trucks	0	4
Pick-up trucks	0	50
Voltage regulators	681	0
Cold rooms	0	7

Source: MOH/DEMM

4.2.3 Health Insurance

Less than 4 percent of the Ivoirian population is covered by health insurance. Those covered by private employer-based insurance are typically covered only for curative services, not for preventive care. The National Social Security Fund (*Caisse Nationale de Securité Sociale*) reimburses only a portion (approximately 50 percent) of medical costs paid by the beneficiary, including vaccinations. However, few people use this because immunizations are essentially free in the public sector. According to the NIP managers, less than 5 percent of all immunizations administered are delivered through the private sector because of the elevated price. Therefore, the contribution of insurance programs to immunization financing in Cote d'Ivoire is considered negligibleprobably less than one-half of 1 percent.

4.2.4 Household Contributions

Fees for the complete series of NIP vaccines charged by private providers today in Cote d'Ivoire are high. If one adds the charges for medical visits to a general practitioner, the total cost is approximately US$ 50. This compares to the estimated public sector cost of approximately US$ 20 per fully immunized child obtained in this study. In addition to this, the INHP provides immunization services for moderate fees in its health facilities. These services include non-NIP vaccines such as Hepatitis B and are targeted at formal sector employees, travelers, and students.

Families contribute to the financing of vaccinations provided by the public sector through the payment of vaccination cards (US$ 0.17 per card). This revenue is reserved for the health centers for small operating expenditures. There are no estimations of the total revenue from this financing mechanism.

The combined contributions of out-of-pocket payments to the public and private sectors for immunization services could be a significant amount of the total financing for immunization services. Further investigation is needed in that matter.

4.3 Trends in Expenditures of the NIP

This section discusses financing trends and the current financing situation of immunization services. As in preceding sections, the discussion first looks at routine activities, then NIDs, and then total costs.

4.3.1 Financing of Routine Activities

For the routine NIP, the three main sources of financing are the government of Côte d'Ivoire, budgetary grants from the European Union Development Fund and KFW. The amounts contributed by different financing sources in 1998 are shown broken out by use, in Table 21. All three of the main funders finance both operational and capital expenses.

Table 21. Sources of Financing for Routine NIP by Use, 1998 (US$)

	Government	EU	KFW	WHO	UNICEF	Total
Recurrent Costs						
Personnel	5,130,535					$5,130,535
Vaccines		1,224,221				$1,224,221
Supplies		344,854				$344,854
Transport	130,777					$130,777
Short-term training				27,821		$27,821
IEC/Social mobilization					37,017	$37,017
Maintenance/Overhead	100,000		72,756			$172,756
Subtotal	5,361,312	1,569,075	72,756	27,821	37,017	$7,067,981
Capital Costs						
Building space	256,663	300,000				$556,663
Vehicles			69,824			$69,824
Equipment			182,474			$182,474
Subtotal	256,663	300,000	252,298	0	0	$808,961
TOTAL	$5,617,975	$1,869,075	$325,054	$27,821	$37,017	$7,876,942
% of total	71%	24%	4.8%	0.1%	0.1%	100%

Table 22 shows the sources of funds for program-specific costs of the routine NIP. Whereas the government of Côte d'Ivoire funds almost 72 percent of the routine program (including personnel and building costs as shown in Table 21), When personnel and building costs are excluded, the government of Côte d'Ivoire only funds 10 percent of the routine program.

Table 22. Sources of Financing for Routine NIP by Use: Program-specific Costs, 1998 (US$)

	Government	EU	KFW	WHO	UNICEF	TOTAL
Recurrent Costs						
Vaccines		1,224,221				$1,224,221
Supplies		344,854				$344,854
Transport	130,777					$130,777
Short-term training				27,821		$27,821
IEC/Social mobilization					37,017	$37,017
Maintenance/Overhead	100,000		72,756			$172,756
Subtotal	230,777	1,569,075	72,756	27,821	37,017	$1,937,446
Capital Costs						
Equipment			182,474			$182,474
Vehicles			69,824			$69,824
Subtotal	0	0	252,298	0	0	$252,298
TOTAL	$230,777	$1,569,075	$325,054	$27,821	$37,017	$2,189,744
% of total	10.5%	71.7%	14.8%	1.3%	1.7%	100%

Table 23 shows the trends in funding for routine NIP by source for years 1996-1999. Funding by the government of Côte d'Ivoire, KFW, and budget assistance from the EU is increasing.

Table 23. Sources of Financing for Routine NIP (US$)

Source	1996	1997	1998	1999
Government	5,170,784	5,303,368	5,617,975	5,870,784
Donors				
EU	1,720,297	1,764,407	1,869,075	1,953,183
KFW	299,180	306,851	325,054	5,000,000
WHO	NA	NA	27,821	29,073
UNICEF	34,070	34,944	37,017	11,859
Donor Subtotal	2,053,547	2,106,202	2,258,967	6,994,115
Total	$7,224,331	$7,409,570	$7,876,942	$12,864,899
Gov't. % of Total	72%	72%	71%	46%

*Based on different sources, estimations made by PHR

4.3.2 Financing of National Immunization Days

The sources of financing for the National Immunization Days campaign for 1998 are shown in Table 24. The largest contributors were the government of Côte d'Ivoire and JICA. The government of Côte d'Ivoire pays for transport and personnel, 36 percent of total costs in 1998. JICA supplies vaccines and made a large contribution to the cold chain in 1998. Its contribution accounted for 47 percent of total costs in that year.

Table 24. Estimates of Expenditures on the NIDs by Source and Use of Funds, 1998 (US$)

	Government	Rotary International		CDC/ USAID	JICA	WHO	UNICEF	Total
		Int'l	Local					
Recurrent Costs								
Personnel	752,676	91,345						$844,021
Vaccines					901,651			$901,651
Supplies							50,000	$50,000
Transport	48,555	65,025						$113,580
Short-term training		19,925						$19,925
Social mobilization		58,525				5,676		$228,480
Monitoring/ Evaluation	3,875	6,564	12,948	151,331		3,441		$13,880
Capital Costs								
Cold chain equipment		37,764			265,016			$302,780
TOTAL	$805,106	$279,148	$12,948	$151,331	1,166,667	9,117	50,000	$2,474,317
% of Total	32.5%	11.3%	0.52%	6%	47.15%	0.36%	2%	100%

Note: Other personnel cost of $90,832 is included in the personnel category. The government of Japan contributed funds for cold chain equipment. In addition, according to WHO, funds from Japan given in 1998 were used to purchase vaccines and operating costs in 1999. This is probably the case for previous years as well.

Looking at financing of NID program-specific costs, however, the picture is again different: The government contribution declines dramatically, to approximately 3 percent (Table 25).

Table 25. Expenditures on Program-specific Costs for the NIDs, by Source and Use of Funds, 1998 (US$)

	Govern-ment	Rotary International		CDC/ USAID	JICA	WHO	UNICEF	Total
		Int'l	Local					
Recurrent Costs								
Vaccines					901,651			$901,651
Supplies							50,000	$50,000
Transport	48,555	65,025						$113,580
Short-term training		19,925						$19,925
Social mobilization		58,525				5,676		$228,480
Monitoring/Evaluation	3,875	6,564	12,948	151,331		3,441		$13,880
Capital Costs								
Cold chain equipment		37,764			265,016			$302,780
TOTAL	$52,430	$187,807	$12,948	$151,331	$1,166,667	$9,117	$50,000	$1,620,296
% of Total	3.1%	11.6%	0.81%	9%	72%	0.4%	3.2%	100%

*Other personnel cost of $90,832 is included in the personnel category. The government of Japan contributed funds for cold chain equipment.
**In addition, according to WHO, funds from Japan given in 1998 were used to purchase vaccines and operating costs in 1999. This is probably the case for previous years as well.

Table 26 shows trends in financing by specific funders for polio eradication activities from 1996 to 1999. The contribution of the government of Côte d'Ivoire has been increasing, assuming that the contributions towards operational costs were similar to that of 1998. While the contributions of a few donors, such as Rotary International, are decreasing, other donors appear to be filling the funding gap.

Table 26. Sources of Financing for the NIDs, 1998 (US$)

	Government		Rotary International*		JICA	USAID through WHO	WHO/ CI	UNICEF
	Operation	Personnel	Int'l	Local				
1996	NA	610,269	1,161,776	NA	NA	NA	NA	50,000
1997	NA	626,746	375,000	26,666	1,166,667	NA	NA	50,000
1998	52,430	752,676	279,148	12,948	1,317,998	624,928	9,117	50,000
1999**	711,250	691,627	509,768	8,571	1,643,375**	298,808	8,164	218,225

*Funds from Rotary International were channeled through WHO.
**According to WHO, 1998 JICA were expended on vaccines and operating costs in 1999. This is probably the case for previous years as well.

4.3.3 Overall Trends

The expenditures on NIDs, the routine NIP, and the health budget are shown in Table 27. The expenditures for NIDs increased at the rate of 23 percent in 1997 and 10.2 percent in 1998. Expenditures for the routine program increased 3 percent in 1997 and 6 percent in 1998. The funding for the National Immunization Program (routine and NIDs) remained constant at 7 percent in 1997 and 1998.

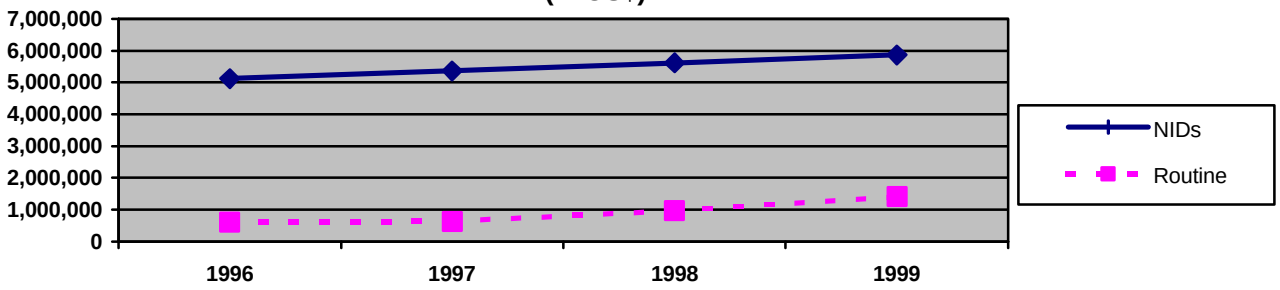
Table 27. Trends in Expenditures on NIDs, Routine NIP and Health Budget in Côte d'Ivoire, 1996-1998

	NIDs (US$)	% Increase	NIP (US$)	% Increase	NIP/NIDs (US$)	% Increase	Health Budget	% Increase
1996	1,822,045	NA	7,224,331	NA	9,046,376	NA	182,566,731	38
1997	2,244,412	23	7,409,570	3	9,653,982	7	173,542,955	-5
1998	2,474,317	10.2	7,876,942	6	10,351,259	7	175,559,068	1
Average annual % increase		16.6		4		7		11

*Assumed government of Côte d'Ivoire contributions towards operational expenses were the same as in 1998. Assumed KFW contribution was $278,840. Based on PHR estimates.

When the trends in contributions of the government of Côte d'Ivoire are examined, the government is gradually increasing its contributions to both components of the NIP, although the years in which the largest increases take place tend to vary (Figure 10). In 1998, the government of Côte d'Ivoire increased its contribution to the routine NIP by 10 percent; in 1999, it appears to have increased its contribution to polio eradication by 33 percent.

Figure 10. Trends in Government Expenditures on Routine NIP and NID Activities, 1996-1999 (in US$)



Other funding sources that contribute to both the routine NIP and NIDs include: USAID, JICA, UNICEF, and WHO. None appear to have decreased their contribution to either activity.

4.4 Analysis of Financing Strategies: Adequacy of Funding, Sustainability, Program Performance Access and Equity

4.4.1 Adequacy of Current Funding and Sustainability of the Routine Program

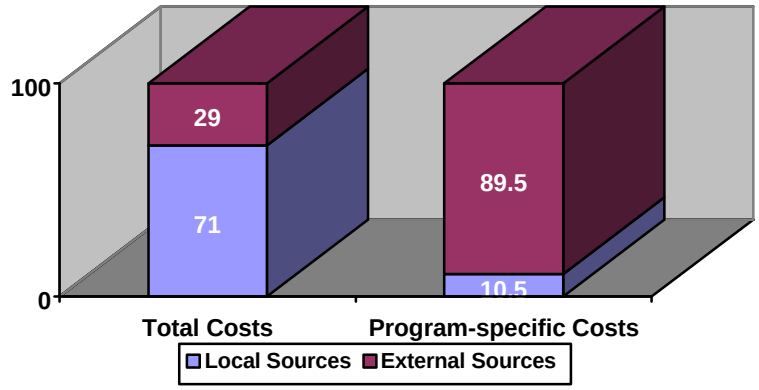
Funding was for the most part adequate for the existing routine NIP. However, many of the major program-specific costs, including vaccines, supplies, and building space, were covered by the EU grant that was suspended in 1999. The other recurrent costs, transport, training, and IEC/social mobilization, are being financed by a combination of the central government, donors, and international organizations. Donors, for the most part, are financing capital costs.

The budgetary restraints resulting from the suspension of the EU grant raises concerns about funding. The program must evaluate the current situation within the context of the goals of the

program. First, the government must reconcile the problems presented by the suspension of the EU grant. Second, because the NIP would like to introduce Hepatitis B and other program improvements, the program will need to mobilize additional funds in order to implement these changes.

In addition, donors and international organizations finance much of the program-specific cost of the routine NIP. Donors provide funding not only for short-term training and IEC/social mobilization, but they also fund some of the operational costs, such as purchasing registers and vaccines.

Figure 11. Financing of Routine Activities in Percents, 1998

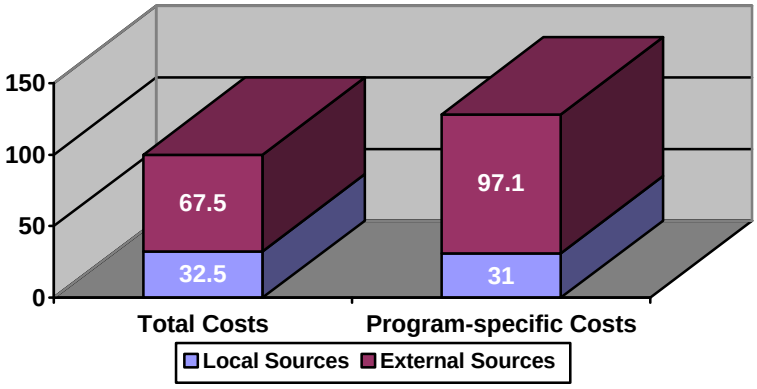


As seen in Figure 11, local sources account for 71 percent of total costs however, when analyzing program-specific costs, local sources account for only 10.5 percent of the costs. In the event that donors decide to reduce their level of funding for the immunization program, the government of Côte d'Ivoire will need to fund these items.

4.4.2 Adequacy of Current Funding and Sustainability of the NIDs and Surveillance

The polio eradication campaign, including NIDs and surveillance, is mostly donor-financed, largely by two donors, JICA and Rotary International. JICA, with the assistance of Rotary International, is financing the vaccine costs. Personnel costs are financed by the central government, and other recurrent costs, of supplies, transport, training, and social mobilization, are financed by USAID, UNICEF, and the central government.

Figure 12. Financing of NIDs Activities in Percents, 1998



Since this campaign is part of a worldwide effort to eradicate polio, it is likely that the activities will continue to be financed mostly by donors and will end in five years. Therefore, dependence on external sources for NIDs is unlikely to become an issue that the government of Côte d'Ivoire will need to address.

5. Cost and Financing Projections of the National Immunization Program

This section presents projections of program costs of the National Immunization Program for the next five years under two scenarios~~the~~ first with the program continuing as is and the second incorporating the improvements and changes desired by the MOH. The section then discusses projected budgets and funding gaps. More data and in-depth study is advisable to refine this analysis.

5.1 Projected Costs of the Existing National Immunization Program

Table 28 displays projections of the recurrent, variable, non-personnel costs of continuing the existing immunization program for the next five years (1999-2003). Projections are based on the 1998 costs estimated in Section 3. Vaccine costs were calculated using the target population size, which assumes a 3.2 percent growth rate (MOH, 1998); the number of doses; and the wastage factor. An annual inflation factor of 4.5 percent was added. Assuming no changes, the program will cost the MOH approximately $3 million per year, with vaccines making up almost 60 percent of the costs.

Table 28. Recurrent, Variable, Non-personnel Costs of Continuing the Existing NIP, 1999-2003

Cost Category	1999	2000	2001	2002	2003	Total
Vaccines	1,848,931	1,905,756	1,964,213	2,025,143	2,090,172	$9,834,214
Supplies	360,372	376,589	393,535	411,245	429,751	$1,971,492
Transport	258,195	269,814	281,955	294,643	307,902	$1,412,510
Short-term training	49,898	52,144	54,490	56,942	59,505	$272,979
IEC/social mobilization	277,444	289,929	302,976	316,610	330,857	$1,517,816
Maintenance/overhead	225,311	235,450	246,046	257,118	268,688	$1,232,613
Total	$3,020,152	$3,129,682	$3,243,215	$3,361,700	$3,486,875	$16,241,624

5.2 Projected Costs of Improvements to the National Immunization Program

This section presents the estimated costs of desired improvements to the NIP for the years 1999–2003.

5.2.1 Adding Hepatitis B to the Immunization Schedule

The MOH would like to begin immunizing newborns against Hepatitis B by adding the combined vaccine DPT/Hepatitis B as an antigen to its routine program. The full series consists of three shots, which the NIP proposes giving to children at birth, and at two months and 12 months of age.

The three tables here present the cost of introducing the DPT/Hepatitis B vaccine over the next five years: Table 29 presents the estimated costs of providing the vaccine in the Côte d'Ivoire capital of Abidjan alone (total population 2.5 million). Table 30 presents the costs of full (immediate) introduction of the vaccine throughout Côte d'Ivoire. Table 31 presents the costs of phased introduction throughout the country over the five-year period. The tables show only the incremental vaccine costs of adding the Hepatitis B antigen to what is currently spent on DPT alone.

Table 29. Estimated Vaccine Costs of Introducing DPT/Hepatitis B Antigen in Abidjan Alone, 1999-2003

	Under One Population Size (<1)	Wastage Coefficient	Vials Needed (10 doses)	Total Cost (US$)
1999	102,029	1.28	39,179	$462,323
2000	105,600	1.28	40,551	$478,504
2001	109,296	1.28	41,970	$495,252
2002	113,122	1.28	43,439	$512,586
2003	117,081	1.28	44,959	$530,526

Note: Uses the 1998 UNICEF price of $13 per vial and the current wastage coefficient for DPT (1.28), and assumes an inflation factor of 4.5 percent.

The costs shown do not include other potential costs of successfully introducing the vaccine, such as the costs of syringes and other vaccine supplies, of training health workers to administer the vaccine, of any cold chain and transportation changes needed to store and distribute the new vaccine, of printing new vaccination cards, and of IEC/social mobilization costs to educate health professionals and the public about the vaccine. However, these other potential costs are likely to be minimal.

Table 30. Estimated Vaccine Costs of Full Introduction of DPT/Hepatitis B Antigen throughout Côte d'Ivoire, 1999-2003

	Under One Population Size (<1)	Wastage Coefficient	Vials Needed (10 doses)	Total Cost (US$)
1999	659,000	1.28	253,056	$3,153,704
2000	672,000	1.28	258,048	$3,215,916
2001	685,000	1.28	263,040	$3,278,129
2002	699,000	1.28	268,416	$3,345,127
2003	716,000	1.28	274,944	$3,426,482
Total				$16,419,358

Note: Uses the 1998 UNICEF price of $13 per vial and the current wastage coefficient for DPT (1.28), and assumes an inflation factor of 4.5 percent.

The additional costs of full introduction of the vaccine nationwide are approximately equivalent to the current spending on NIP recurrent variable, non-personnel costs.

Table 31. Estimated Vaccine Costs of Phasing in DPT/Hepatitis B Antigen throughout Côte d'Ivoire, 1999-2003

Year	Under One Population Size (<1)	Target Population Hep B	DPT-only Population	Cost of DPT Alone	Cost of DPT and Hep B	Net Cost (US$)*
1999	659,000	100,000	559,000	285,492	499,200	$817,642
2000	672,000	254,000	431,000	220,120	1,267,968	$1,522,338
2001	685,000	408,000	277,000	141,469	2,036,736	$2,212,455
2002	699,000	562,000	137,000	69,969	2,805,504	$2,910,423
2003	716,000	716,000	—	—	3,574,272	$3,610,072

Note: Uses the 1998 UNICEF price of $13 per vial and the current wastage coefficient for DPT (1.28), and assumes an inflation factor of 4.5 percent.
* Net costs include the costs of DPT vaccine and those of the combined DPT/Hepatitis B vaccine.

5.2.2 Increasing Coverage Rates to 80 Percent

As mentioned in Section 1, one of the NIP's goals is to attain a nationwide coverage rate of 80 percent for all NIP vaccines provided to children under age one (BCG, DPT, measles, and tetanus toxoid). While some localities, especially urban areas, have achieved coverage rates approaching 80 percent, a substantial number of others, especially isolated rural areas, have considerably lower rates.

Table 32 shows the vaccine and supply costs estimated to reach 80 percent coverage.[6] The figures include only vaccine and supply costs, because it is difficult to estimate the training, transport, and social mobilization costs of increasing coverage. This is not to negate these other costs however; simply providing additional vaccines will not ensure increased coverage since there are areas of the country that are difficult to reach due to poor infrastructure. Moreover, the costs of reaching these areas will increase exponentially since the harder the area is to reach, the more resources must be consumed to carry out the vaccinations.

Table 32. Vaccine and Supply Costs of Increasing Coverage to 80 Percent (US$)

Year	Total Cost of Vaccines*	Total Cost of Supplies**	Total Cost
1999	258,552	63,433	$321,985
2000	267,601	65,654	$333,255
2001	276,967	67,951	$344,919
2002	286,661	70,330	$356,991
2003	296,694	72,791	$369,486
Total	$1,636,284	$401,448	$2,040,431

* The vaccines cost projections are based on current coverage rates. For example, the coverage of BCG is 71% in a population of children 0-5 years of age that numbers 599,574. Therefore 53,871 more children must be vaccinated with BCG to reach 80% coverage.
** Supplies are calculated by multiplying the population by syringe prices of US$ 0.05/syringe.

[6] Vaccine procurement decisions are already based on vaccinating 100 percent of the population, but, through wastage and other factors, that procurement does not meet needs.

In the past 10 years, the NIP has used the National Immunization Days as a major means of increasing polio immunization coverage in the rural, hard-to-reach areas of the country. This is because regular access to basic health services in these areas continues to be poor. In addition, the use of mobile health teams to deliver immunization and other basic health services on a periodic basis also varies considerably from one area to the next and depends on the availability of local vehicles, equipment, and budget.

Since the NIDs are resource-intense, are less cost-effective than routine health services in delivering immunizations, and take place only twice each year, a more effective and efficient strategy to increase coverage in the rural, isolated areas will require a more local approach. This approach could involve the following activities:

- "Reactivating" mobile health teams that, in effect, are presently deactivated for lack of resources;
- Organizing at the local level mini-campaigns and campaigns targeted to specific populations, which can be adapted to meet the specific environmental and cultural needs of each area;
- Studying the factors related to people's acceptance and access to immunization services in order to improve the effectiveness and efficiency of strategies to increase coverage.

The costs to implement such an approach would consist mainly of transportation costs, travel costs for personnel, and social mobilization and IEC costs. This study was not able to estimate these costs, primarily because accurate coverage data per province are not available, since administrative reports provided to the NIP show rates that are considered highly inflated.

Further research is needed to determine the best approaches to expand coverage, and, thus, what the added cost would be. Improving the accuracy of routine immunization reports to obtain more accurate coverage data, as discussed below, will be an important step in determining these costs.

5.2.3 Additional Costs of Introducing Auto-Destructible Syringes

To ensure vaccine safety, the NIP would like to introduce single-use syringes. One type of single-use syringe is the auto-destructible syringe, in which the needle cannot be drawn out after use. The projected cost of introducing auto-destructible syringes for all antigens, excluding Hepatitis B, and for disposal boxes to ensure safe disposal of used syringes is shown in Table 33. These projections are based on projections of the number of newborns in the target population, women of reproductive age, and doses required for each vaccine. They do not include, however, other costs required for safe disposal, such as the costs of constructing an incinerator system and costs associated with collecting and incinerating used syringes (e.g., transport, staff). It is beyond the scope of this study to estimate the additional costs of proper syringe disposal; however, they are likely to contribute significantly to both the recurrent and capital costs of the immunization program. Not taking these additional disposal costs into account, the added costs of using auto-destructible syringes for all vaccines except Hepatitis B are estimated at US$ 2.5 million over five years.

Table 33. Projected Additional Cost of Introducing Auto-Destruct Syringes for all Antigens, Excluding Hepatitis B (US$)

Year	Total No. of Syringes Needed	Curent Total Cost of Syringes*	Additional Cost of Auto-Destructible Syringes**	Total Cost using Auto-Destructible Syringes
1999	5,315,446	289,964	180,453	470,417
2000	5,481,357	289,964	195,136	485,100
2001	5,652,164	289,964	210,252	500,217
2002	5,830,040	289,964	225,994	515,959
2003	6,019,161	289,964	242,731	532,696
TOTAL	$28,298,168	$1,449,820	$1,054,566	$2,504,388

*From 1997 annual costs. Includes syringes, needles, sterilizers, timers and maintenance. Inflation factor of 4.5% per year is used.
**Based on 1998 price of $0.08 for syringes and includes cost of disposal boxes ($0.85 each).

5.2.4 Improvements to the Cold Chain

The cold chain was completely renewed in 1998; grants from JICA and KFW permitted the NIP to make valuable upgrades~~re~~place refrigerators, freezers to store vaccines, and vehicles to transport them. Nevertheless, additional improvements are needed. In particular, construction of seven new cold rooms outside Abidjan is planned. Table 34 shows the projected outlays required for these improvements over the next five years.

The construction of additional cold rooms for storage of vaccines was proposed in the 1996 NIP five-year plan. The need for them is pressing since existing cold rooms are only located in Abidjan. This is not only quite far from many of the districts but also expensive to reach due to the cost of fuel. Making vaccines available from cold rooms in outlying districts would decrease the time and resources needed by local communities that must now travel to Abidjan to retrieve vaccines.

Table 34. Projected Expenditures Required to Upgrade the Cold Chain System, 2000–2003 (US$)

Cold Chain Improvement	2000	2001	2002	2003	TOTAL
Construction of cold rooms*	$133,056	$133,056	NA	NA	$266,112
TOTAL	$133,056	$133,056	NA	NA	$266,112

* Based on building seven new cold rooms by 2001.

5.2.5 Summary of Expenditures for Planned Improvements to the NIP

Table 35 shows the total outlays required for the National Immunization Program over the next five years with the improvements desired by the MOH. Implementing all of these improvements would more than quadruple the program's expenditures from approximately $3 million per year to over $14 million. The addition of Hepatitis B alone would double the program cost.

Table 35. Estimated Expenditures of the NIP with Planned Improvements, 1999-2003 (US$)

Improvement	1999	2000	2001	2002	2003	Total
Introducing Hep B (full intro.)	3,153,704	3,215,916	3,278,129	3,345,127	3,426,482	$16,419,358
Adding auto-destructible syringes	180,453	195,136	210,252	225,994	242,731	$1,054,566
Increasing coverage to 80%	321,985	333,255	344,919	356,991	369,486	$1,726,636
Contructing cold rooms	1,551,161	133,056	133,056	NA	NA	1,817,273
Vehicles for NIP*	4,617,520	NA	NA	NA	NA	$4,617,520
Maintaining cold chain equipment**	255,817	267,238	279,358	291,929	305,066	$1,399,499
Operating cold chain equipment***	126,458	132,243	138,194	144,412	150,911	$692,218
Maintaining vehicles**	429,550	448,880	469,079	490,188	512,246	$2,349,943
Operating vehicles***	442,883	462,813	483,640	505,403	528,147	$2,422,886
Subtotal	$11,079,621	$5,188,626	$5,336,627	$5,360,045	$5,535,069	$32,499,988
Existing program	3,020,152	3,129,682	3,243,215	3,361,700	3,486,875	16,241,624
Total	$14,099,773	$8,318,308	$8,579,842	$8,721,745	$9,021,944	$48,741,612
Total Additions as % of Current Program	467%	266%	265%	259%	259%	

*Based on estimates by KFW, which conducted a study on the maintenance and operations of costs of the cold chain (Bouyssou, 1998).
**Includes the costs of two visits per year for cold chain equipment and service, repairs, tires and batteries for vehicles.
***Includes the costs of electricity or fuel for the cold chain equipment and vehicles.

5.3 Projected NIP Budget and Funding Gap for the Next Five Years

This section examines the ability of the NIP to pay for the additional outlays required over the next five years, by projecting the expected funding available and the gap between this funding and the required expenditures discussed above.

The study estimated the need for government funding for the immunization program over the next five years based on estimated recurrent variable non-personnel costs, rather than the NIP budget. These costsvaccines, supplies, short-term training, and IEC/social mobilizationhave traditionally been paid with donor funds. (The Côte d'Ivoire government funds personnel costs associated with the immunization program.) Sustainability of the program depends on continued donor support the program or the ability of the Côte d'Ivoire government to finance the program.

Table 36 looks at projected funding. It assumes that the European Union will reinstate its grant to the NIP and that other donors (UNICEF, WHO, KFW, JICA, etc) will continue their funding role.

Table 36. Projected Funding of the NIP 2000-2003 (US$)

Funding	2000	2001	2002	2003	Total
From government, including EU grant	1,252,631	1,308,999	1,367,904	1,429,460	$6,557,685
From other donors*	1,491,747	1,558,875	1,629,025	1,702,331	$7,809,486
Total	2,744,378	2,867,875	2,996,929	3,131,791	$14,367,171
Costs of Continuing the Existing NIP	3,129,682	3,243,215	3,361,700	3,486,875	$16,241,624
Costs of Current Program + All Proposed Improvements	8,318,308	8,579,842	8,721,745	9,021,944	$49,055,408
Budget Gap	$5,573,931	$5,711,967	$5,724,816	$5,890,154	$34,374,442

Note: Figures include inflation rate of 4.5%.
* Donors are JICA, KFW, WHO, UNICEF, Rotary International, and the CDC/USAID. The grants from KFW and JICA to replace vehicles and the cold chain are not included as a basis for projections.

The additional expenditures required for the planned improvements will create a funding gap of close to US$ 6 million per year unless additional funds from the government or from other sources are found (see Table 37). Moreover, if the EU continues to suspend its contribution, this gap will increase to over US$ 7 million per year. Clearly, if the MOH plans on implementing these changes, it will either have to mobilize additional funds, reduce program costs, rationalize, or phase-in the desired changes~~or~~ most likely, do all of the above.

Table 37. Projected Budget Gaps in NIP, 2000-2003 (in US$)

	2000	2001	2002	2003	Total
Current Funding	2,744,378	2,867,875	2,996,929	3,131,791	$14,367,171
Costs of Continuing the Existing NIP	3,129,682	3,243,215	3,361,700	3,486,875	$16,241,624
Costs of Current Program + All Proposed Improvements	8,318,308	8,579,842	8,721,745	9,021,944	$49,055,408
Budget Gap	$5,573,931	$5,711,967	$5,724,816	$5,890,154	$34,374,442

6. Summary, Conclusions, Lessons Learned and Recommendations

6.1 Conclusions and Lessons Learned

The major conclusions and lessons learned resulting from this analysis are the following:

- The government of Côte d'Ivoire has made progress over the past five years, as evidenced by the coverage rates during this period. Both the financing and procurement strategies developed have greatly facilitated the improvements in the program's performance. However, coverage rates declined slightly in 1998 and even more so in 1999 due to budgetary constraints and resource limitations for the mobile and outreach strategies. The situations were exacerbated in poor areas.

- The vaccine and supply procurement system (PSP-INHP) is well organized and seems effective.

- Assuming continued budgetary assistance from the European Union and the existing budget line item on vaccines, the vaccine supply is regular and facing no major financial difficulty at the central level; however, there are noticeable shortages at the peripheral level.

- Huge investments were realized between 1997 and 1999 for the renewal of the cold chain and the means of transport at the central level as well as in the district areas.

- However, the financing strategy is heavily dependent on the EU and other donors and is not sustainable over the long term.

- The health indicators reveal a negative and disturbing evolution in recent years as shown in the DHS studies of 1994 and 1998 (in particular the infant mortality and under five mortality rates).

- The experience in Côte d'Ivoire demonstrates that there is some risk to using external funding, including EU budgetary aid, to fund the recurrent costs of an immunization program. Ideally, use of donor funds should be a short-term approach accompanied by a plan for the gradual reduction in the use of the external funds and their replacement with local resources. If this does not occur, the program may find itself in the difficult position of having to seek a large sum of replacement funds at all once from the government or from other external sources. External resources are best used for long-term investments; for example, infrastructure improvements, such as the cold chain; critical systems, such as diseases surveillance and routine immunization reporting; capacity-building; and perhaps introduction of new vaccines.

- To create sustainable long-term financing for the immunization program will therefore require a financing of operational costs based largely on local resources. This can be accomplished by both increasing central government budget allocations through the

operating budget and tapping into other local sources, such as insurance and local government and community contributions.

- External funding for vaccines and other critical program components has not only created a dependency on external support, but has perhaps also relaxed pressure for the efficient use of resources. This is most apparent in the large discrepancy the study found between the estimated vaccine needs of the country, using population projections and current wastage rates, and what the program actually buys each year. Using truly local resources to buy the vaccines and other supplies would encourage changes in the way vaccine needs are determined, vaccine stocks are managed, and other resources are used.

- Finally, to establish an immunization program that is both successful and sustainable over the long term, the government of Côte d'Ivoire needs to develop a multi-year strategic plan for the routine program. This plan should be based, first of all, on the government's objectives and the immunization needs of the population~~wh~~ich should be based on solid data~~an~~d then on the availability of resources. Making program plans and decisions based on solid information will require improving the NIPs and MOH's capacity in planning, applied research, and coordinating with other agencies and departments both within and outside of the MOH. Information needed to plan a strong program includes:

  - Data on disease burden, through regular disease surveillance and reporting, and through special research studies (e.g., to determine the need for new vaccines such as Haemophilis influenza type B [Hib]);
  - An inventory of cold chain equipment, and its condition to determine replacement, and operation needs. This will require an initial study of current equipment and needs, as well as a system to monitor and track equipment needs on a regular basis. The monitoring system would allow equipment to be replaced on a systematic and regular basis, rather than all at once.
  - One of the critical issues is maintenance of the cold chain especially after the contribution from JICA and KFW for cold chain renewal. One of the requirements made by KFW was a clear and consistent commitment of the government to mobilize an annual budget for cold chain management and operational costs. This study provides some estimates of these costs.
  - Data on the effectiveness and cost-effectiveness of different strategies to improve immunization coverage, including: NIDs, regional or locally based campaigns, increasing routine outreach activities (e.g., through mobile health teams), social mobilization activities, and building additional health facilities in underserved areas.

6.2 Recommendations

Based on the findings of this study and the ongoing health sector reforms, the following recommendations are made:

Program Planning, Management, and Evaluation

- The government should develop a national immunization strategic plan for the next 10 years that includes program objectives; plans for the introduction of new vaccines and other improvements, based on the results of this study and future data collection and analysis;

plans for conducting additional research to obtain critical information on which to base program decisions; plans for capacity building (training and technical assistance) in critical areas; and plans for financing the program in a sustainable manner, based largely on country-level funding and in conjunction with the planned health sector reforms.

- In the context of district annual planning, the program should develop detailed *annual* immunization plans, which should include: quantifiable coverage and other performance objectives by district or region; activities planned to increase coverage; and resources to be mobilized by province. Annual planning will allow the program to more easily assess its performance on a regular basis and make necessary changes. The planning would involve the local NIP coordinators and other appropriate regional and departmental personnel, and would therefore also serve as a training exercise in program planning and evaluation, in anticipation of the decentralization of the NIP.

- The consideration and analysis of costs should be included in the program decision-making process on a more systematic and regular basis, along with the considerations of effectiveness and quality. This is especially critical as the government and other internal resources finance more and more of the program in the future. The dimension of cost and cost-effectiveness should be taken into account when considering the introduction of Hepatitis B or other new vaccines; the type of single-use syringe to procure (auto-destructible vs. regular disposables); whether to continue to rely on the NIDs to improve coverage in isolated areas vs. improving routine service delivery; the best ways to improve outreach; whether to introduce a new vaccine such as Hib; and so forth. To more systematically include cost considerations in the planning of the NIP would require the following:

    - Following up this study with district-level cost analyses to obtain further information on costs at the local level, the costs of different delivery strategies (e.g., mobile health teams, home visits, mini-campaigns), and the costs of delivering services under different conditions (e.g., rural vs. urban settings);
    - Providing training to NIP staff on cost and financing analysis for immunization and other public health activities, and to those responsible for immunization activities at the regional or district level on cost analysis and its practical use in program planning and implementation; and
    - Collecting cost data on a regular basis by including cost information on routine NIP reporting forms and in coverage or evaluation surveys.

- Training in different aspects of planning, management, and evaluation should be provided to the NIP staff to build long-term capacity in these areas. This can be accomplished through the staff's involvement in the development of a long-term strategic plan with outside technical assistance as well as through short-term intensive training sessions and refresher courses.

- Planning for the effect on the NIP eventual decentralization of the health system should begin soon and be incorporated into the long-term NIP strategic plan. Responsibilities of regional and district authorities will likely increase and could include maintaining and financing regional cold rooms, distributing vaccines and vaccine supplies to the provinces, replacing cold chain equipment, and planning and implementing more targeted mini-campaigns that could eventually replace NIDs. Plans for decentralization should include identification of training needs for regional- and provincial-level personnel in planning, financing, management, estimating vaccine needs, etc.; training plans based on identified

needs; clear identification of central vs. regional- and provincial-level roles and responsibilities; and plans for coordination between the central and other levels. The role of the central-level NIP should change accordingly to move away from the day-to-day management of the program to overall planning and coordination, including such functions as the following:

- Setting strategic objectives and determining new approaches;
- Developing management, reporting, and evaluation tools;
- Procuring vaccines and supplies for the country;
- Coordinating with other health programs and divisions involved in preventive health services, epidemiology, primary health care, etc.
- Doing financial planning and budget setting at the national level;
- Collecting, analyzing and disseminating information (e.g., on coverage rates, routine service delivery statistics, disease surveillance);
- Providing technical assistance to decentralized levels; and
- Doing research, assessment, and evaluation.

The new role of the NIP entity should support decentralization and integration of program activities at the regional and district level.

Applied Research

Plans for the future of the program, including the introduction of new vaccines and technologies and the diversification of financing sources and mobilization of new resources, should be based on information concerning needs, effectiveness, costs, and cost-effectiveness. Given the program's objectives and plans for the future, the following applied studies and analyses are recommended at the central and provincial levels:

At the national level:

- An inventory study of the current cold chain system with periodic updates to determine the numbers, types, and condition of equipment in use; the equipment and storage needs for the next 10 years or so; and the type of system to put in place to maintain, manage and monitor the system on a regular basis. Maintenance and operation issues are crucial to address both in terms of financing and local capacities;

- A study on the current and potential role of the private sector in immunization service delivery and financing to help determine: the current participation of the private health sector in delivering immunization services; the ways to increase the role of the private sector without compromising quality; the obstacles to increasing private sector involvement; the impact on coverage and equity of access that greater involvement of the private sector would have, if any; the potential impact of expanding insurance coverage on private sector participation in immunization service delivery; and the potential pros and cons of various incentives for the private sector;

- For mid-term planning, studies on the burden of disease targeted by new vaccines, such as Hib and rotavirus, to determine which vaccines to introduce, to which target population, and when;

- An analysis of what a future measles elimination campaign would involve in terms of target population, length of time to achieve elimination, costs, financing, involvement of other sectors of the government and of society, diversion of resources from other NIP and MOH activities, and so forth. It would be interesting to complete a cost-effectiveness study comparing the vaccination campaigns against measles to a policy of strengthening coverage rates for children under one year and effectively covering the target population by a second dose at six years.

At the district level:

- An analysis of the differences in immunization coverage by area and socio-economic level of the population in order to determine effective strategies for improving coverage in low performing areas;

- A study on ways to improve immunization coverage, considering the effectiveness, costs, and cost-effectiveness of different delivery and social mobilization strategies, including NIDs; local-level mini-campaigns; increased outreach through mobile health teams, home visits, etc.; and different types of information, education, communication and social mobilization strategies;

- An analysis for each district of the potential for reducing vaccine wastage, for which antigens, and how to reduce wastage.

Vaccine Procurement and Supply

- The PSP imports vaccines and supplies from the open market using tenders and bids to organize competition among suppliers. INHP plays a capital role and deals with the reception, storage, and distribution of the vaccines and other products useful for EPI activities.

- An evaluation of the performance of this procurement organization is needed. The question of the functions and the responsibilities is to be clarified, for example, for the estimate of the needs, the determination of the priorities and the management of the budgetary constraints. Evaluations are necessary to maximize the benefit of the accumulated experience.

- NIP/INHP/PSP staff should receive additional training in determining vaccine needs based on actual population and vaccine wastage data; how to develop and negotiate an international tender and bid for vaccines; and how to manage and monitor vaccine stocks. Systems should also be developed to assist with these tasks.

- The Côte d'Ivoire government should establish a national authority for the control of biological products. WHO can assist in the formation and training of the control authority.

- The NIP/INHP staff should adopt a method of determining vaccine needs for each antigen based on actual projections of the target population and on current vaccine wastage rates in Côte d'Ivoire. The MOH technical staff should be able to receive training from the donor community on this method, as well as how to develop and negotiate an international tender and bid for vaccines and how to manage and monitor vaccine stocks. Improved stock management potentially could save 20-40 percent in vaccine costs per year. Systems should also be developed to assist with these tasks.

- The MOH should conduct an assessment with the regions and districts to determine the potential for reducing vaccine wastage, and how to achieve this. A plan for reducing wastage, followed by appropriate guidelines and training of central and district staff, should then be developed, based on the results of the assessment.

- In order to purchase Hepatitis B vaccine, the MOH will have to gradually increase its budget to cover the vaccine and supply costs and not to rely solely on external contributions.

Financing

- The government of Côte d'Ivoire needs to "internalize" the financing of its National Immunization Program over the next five years by increasing its central government allocations to the program and exploring the feasibility and making plans for mobilizing new resources, including revenue from PSP and INHP, health insurance reimbursements, and local government contributions. The government should plan on financing from its own funds 100 percent of the basic vaccines and vaccine supply needs.

- Create a NIP assistance fund or coordinating mechanisms that would assemble all external contributions to immunizations. The objective of the fund would be to allocate resources for immunizations in an integrated fashion according to the priorities defined by the health authorities. This fund would avert short-term allocations made without consideration for the longer term and clarify and simplify the national immunization effort. The type of management of such a fund would have to be determined.

- The MOH, INHP and PSP should explore the option of using cross subsidization between NIP and non-NIP vaccines in order to finance vaccines offered in the public sector. An in-depth study is needed to make decisions in this matter.

- A study on the options of contribution of the PSP and the INHP to the financing of the vaccines, supplies, and other expenses such as maintenance and operation of the cold rooms should be conducted. The pricing of services, the commercial margins, and the range of the activities and the services offered by these organizations are to be evaluated. Their contribution could be substantial and would make it possible to widen the base of local NIP financing. Careful thought on the priorities of vaccination, the price policy, and the role of the PSP and the INHP is needed in order to make strategic decisions.

- A study of cost recovery and out-of-pocket payments for government immunization services should be carried out to determine the extent to which cost sharing is currently practiced in the government sector, including charging a fee for vaccination cards; to analyze the amount of revenues generated and the uses of these revenues; and to analyze the feasibility of officially instituting cost sharing for immunization services in the government sector and the possible impact on financing, coverage, and equity.

Annex A. National Vaccination Schedule for Côte d'Ivoire

Table A-1. National Vaccination Schedule

Age of the Child	Vaccine
At birth	BCG, OPV 0
6 weeks	DPT 1, OPV 1
10 weeks	DPT 2, OPV 2
14 weeks	DPT 3, OPV 3
9 months	Measles, Yellow Fever
16 months	DPT, OPV
7 years	DPT, OPV

Table A-2. Tetanus Toxoid Vaccination Schedule for Women of Child-bearing Age

Dose	Immunization Dates and Intervals
TT 1	As soon as possible in child-bearing age women, or the sooner possible during pregnancy
TT 2	At least 4 weeks after TT1
TT 3	One year after TT2
TT 4	One year after TT3
TT 5	One year after TT4

Annex B. Review of Three District Health Centers

Introduction

The Partnerships for Health Reform (PHR) Project in collaboration with the World Health Organization (WHO), the Ministry of Health (MOH) and the National Immunization Program (NIP) of Côte d'Ivoire conducted an in-depth case study on the cost and financing of immunization services in Côte d'Ivoire. As part of this study, an evaluation at the local level was conducted to illustrate the diverse activities taking place among the regions.

Objectives

The main objectives of the local study were to:

- Determine the objectives, organization, available resources, and financing of vaccination services at the local level.
- Provide qualitative data to validate information at the central level.
- Provide recommendations to the Ivorian government on ways to improve its current immunization program at the local level.

Methodology

Three district health centers were selected to represent the diverse activities occurring in Côte d'Ivoire's immunization program. Of the districts selected, two were chosen to examine external agency projects being conducted at the local level. Bouaflé district health center is in collaboration with UNICEF (*Soins de Santé Primaire Initiative*, Bamako, SSPIB) and Tiassalé district health center is a pilot district for the World Bank's Minimum Benefits Package (PMA) project. A third district, Yamoussoukro, was added to draw comparisons from a district without donor agency involvement. The local study review was expanded to include two rural health centers from each district. The district health centers selected a weak and strong heath center to provide a range of qualitative data. Information for the local study was collected through informational interviews with district and rural health center staff and reflects only the status and situation of the health center identified. It is important to note that the quality of the quantitative data should be approached with caution because it is frequently based on estimations.

Socio-Economic Context and Background

Bouaflé

Bouaflé district health center is located in the center-west of Côte d'Ivoire, approximately 300 km from Abidjan. The region is predominately agriculturally based. Coffee, cotton, and cocoa are the principal products. The population is estimated at 430,000 for 1999. The rural population represents 54 percent of the district, and 58 percent of the population lives farther than 5 km from a health center.

The district health center of Bouaflé, in collaboration with UNICEF, is participating in the SSPIB. This activity began in 1994 and received financial assistance for recurrent expenses the first two years. The progress of the project has weakened through the last year and the field visit provided an opportunity to examine the problems it has experienced. Unfortunately, the visit to the district's second rural health center was cancelled because the nurse was not available.

Tiassalé

Tiassalé district health center is located in the south of the country and is approximately 130 km from Abidjan. The region is predominately forested, and coffee and cocoa are an important component of the local economy. The region also favors fishing activity due to its proximity to the Bandama and N'zi rivers. The population is estimated at 274,431 in 1999, and 30 percent live farther than 5 km from a health center.

The district health center, in collaboration with the World Bank, wrote a proposal requesting technical assistance for the training of personnel in immunization services. This activity enters into the framework of the World Bank's PMA project. The field visit revealed that this pilot project has not been implemented.

Yamoussoukro

The district health center of Yamoussoukro is located in the central region, approximately 250 km from Abidjan. Agriculture (coffee, cocoa) is the dominant economic activity. The population is estimated at 398,408 in 1999. Approximately 18 percent of the population lives more than 5 km from a health center.

Yamoussoukro district health center is currently not involved with a project intervention. An overview of this district may serve as an example for the remaining district health centers in the Côte

Routine Vaccinations

Coverage Rates and Objectives

Immunization Objectives

The target population for Côte d'Ivoire's National Immunization Program is calculated by the Institute of National Public Hygiene (*Institut National d'Hygiène Publique,* INHP) based on birth statistics from the Department of Statistics. These theoretical needs, combined with the preceding year's coverage rates, determine the immunization program objectives. The coverage rate objective established for 1999 was 80 percent of the target population (children under the age of one). The coverage rate objective at the district level is determined in the same manner as the national level.

Bouaflé district health center calculated its objectives based on their target populations, resources and national coverage rate objectives. However, the theoretical and actual needs determined at the local level are typically greater than those calculated by the INHP. Tiassalé and Yamoussoukro district health centers also mentioned vaccine shortages of a similar nature. Obtaining maximum coverage rates are impeded by shortages at the national level. For example, during the period of this study, the rural health centers in the Bouaflé district had not received the yellow fever vaccine for two months.

The team visited rural health centers and found that in Bouaflé (SSPIB zone), the nurses were trained to determine their target populations, vaccine needs, and objectives.

The situation in the rural centers of Tiassalé varied. One nurse was calculating his needs based on the target population and had calculated his objectives for the year. The nurse from the second rural health center had not been trained and was not assuming these responsibilities.

In Yamoussoukro, the rural health centers were not aware of their target populations, objectives or how to calculate their needs. Their vaccine needs were based on what they used the previous month, what was left, and then projected for the following month. Other centers simply waited until their stock was low.

Coverage Rates

In the districts of Bouaflé and Tiassalé, vaccination coverage rates are the highest for the antigens BCG, DPT3, measles, yellow fever, and TT between the years 1994 to 1998. However, the 80 percent objective was not attained for all antigens. In contrast to these two districts, Yamoussoukro district health center has lower rates for BCG, DPT3 and neonatal tetanus during this same period. The Yamoussoukro district team explained that their old vehicles and lack of motorcycles at the majority of health centers contributed to this problem. Tables B-1, B-2, and B-3 show coverage rates in the three districts.

Table B-1. Coverage Rate by Antigen. Bouaflé District, 1994-1998)

Year	Vaccination Coverage Rate (%)				
	BCG	DPT3	Measles	Yellow Fever	TT
1998	84	63	63	56	67
1997	73	57	50	46	55
1996	74	53	55	50	17
1995	56	45	54	46	12
1994	56	35	44	37	15

Table B-2. Coverage Rate by Antigen. Tiassalé District (1994-1998)

Year	Vaccination Coverage Rate (%)				
	BCG	DPT3	Measles	Yellow Fever	TT
1998	95	84	88	70	48
1997	102	83	81	61	20
1996	74	77	76	69	14
1995	66	51	62	44	30
1994	51	31	33	28	14

Table B-3. Coverage Rate by Antigen. Yamoussoukro District (1994-1998)

Year	Vaccination Coverage Rate (%)				
	BCG	DPT3	Measles	Yellow Fever	TT
1998	64	45	40	32	8
1997	75	46	35	31	10
1996	48	40	39	32	9
1995	56	36	36	30	20
1994	59	36	28	20	19

Structure and Strategy of the Immunization Program at the Local Level

District Health Centers

Côte d'Ivoire has 42 district health centers, which are responsible for supporting the immunization activities at the rural level. District directors coordinate the health services on the district level; these include NIP services. A dispensary is attached to the district health center and vaccinations take place there several times a week. However, this service is of minor importance compared with the coordination of vaccination services throughout the district. An NIP team,

typically composed of a doctor, nurses, and midwives, coordinates NIP services with the director of the district. The NIP team is responsible for managing the NIP program, including epidemics and outreach strategies as well as supervising the immunization activities at the rural health centers and conducting mobile activities. The team is supervised and supported by the NIP executive director. District health centers procure their vaccines at the INHP in Abidjan. The NIP coordinator is responsible for collecting vaccines for all rural health centers in his/her district. In theory, the NIP team travels to Abidjan once every trimester with its order. However, frequent vaccine shortages at the INHP in Abidjan create problems. The shortages prevent vaccines from reaching the rural health centers. The NIP teams are often required to make several trips to the INHP each quarter because not all vaccines and supplies are available at the same time. For example, the district may need BCG and measles vaccines, and the INHP may only have BCG. The district collects BCG and then must return to the INHP when the measles vaccine becomes available. These additional trips result in a financial strain for the district health centers because they do not have the means to pay for fuel. The situation is further complicated because the INHP closes before noon daily. With the long travel time, the NIP team is then required to spend an even greater amount of time in Abidjan, increasing their expenses.

Currently, the district health centers are managed at the central level. The central level is responsible for managing the distribution of supplies and the appointment of staff to the rural, urban, and district health centers throughout the country. This strategy poses problems for the district health centers. Directors are unable to transfer staff within their district without the agreement of regional authorities. If there is a surplus of health workers in one health center, the director has the authority to transfer the worker to an area in need. If the regional director agrees, the district health officer proposes the transfer to the local government representative and the government representative makes the final decision for internal transfer. The director of Yamoussoukro expressed frustration over this situation in terms of supplies. Refrigerators were donated to rural health centers in the district. However, the lack of overall communication and authority between the district and the central level resulted in electric refrigerators being sent to health centers, which did not have electricity. The director did not have the authority or means to transfer this equipment to a deserving village that had electricity. The NIP intends to decentralize the program next year in order to address the issues posed by a centrally managed system.

Mobile Strategies

Mobile strategies provide vaccination services to members of the population who live more than 10 km from a vaccination center. The mobile strategy is conceived especially for those villages, which are not covered by the outreach services from the centers.

The district of Bouaflé has one vehicle to complete the mobile strategies. However, the availability of fuel often restricts this activity.

The district of Tiassalé organizes the mobile strategies through four teams. One mobile delivery team is composed of a midwife, a JICA volunteer, four health center assistants, and a chauffeur. They conduct a 10-15 day trip every other month. The other three teams, composed of a nurse and a chauffeur, conduct one trip each month. The nurses and community health workers (*Agent de Santé Communtaire,* ASCs) at the rural health centers support the mobile units and are responsible for organizing the activities. The teams do not receive any compensation for expenses incurred during these trips

The district of Yamoussoukro has been unable to complete mobile strategies since 1997. This situation is due to the status of their vehicles, which were allocated to the health center in 1986.

Rural Health Centers

Rural health centers are responsible for administering vaccines through fixed and outreach vaccination strategies. Fixed strategies are typically completed once or twice a week at the health center. Outreach services depend on the mobility of the rural vaccination team. Rural health centers are responsible for collecting their vaccines at the district health centers. Vaccine shortages at the INHP and district health centers are felt at the rural level when nurses come to pick up their vaccines each month. The population contribution for routine services often pays for the transportation to the district health center for needed supplies through cost recovery schemes at the health center level. Some district health centers, such as the one in Yamoussoukro, provide rural health centers with a motorcycle and up to five liters a month in gasoline certificates. Some rural health centers do not have electricity or gas refrigerators to store vaccines. The situation is improving considerably due to JICA's effort to provide refrigerators for all rural health centers. A considerable donation of logistical equipment is expected from KFW in the near future.

Each rural health center has at least one nurse or midwife, who is assisted by a health center assistant and an ASC. The role of the health center assistant is to assist the nurse with the routine activities at the health center. The village appoints this person. The health center assistant may receive a small salary from the cost recovery of routine services. The rural health centers are also assisted by ASCs. These agents may work independently as a liaison between the health center and a surrounding village or within the village of the health center. They are typically a member of the community and work with the nurse in mobilizing and educating the village. They also participate in vaccination activities and other preventive care. Villages may contribute to the transportation of the ASC or vaccination team. Each community also forms a management committee (*comité de gestion*, COGES). The purpose of the COGES is to manage the health center and mobilize and educate the community in health matters. The COGES typically consists of the nurse and several influential members of the community. This group varies in size and structure depending on the interest of the community but typically is made up of a president, secretary, and treasurer. It is important to note that the COGES frequently does not function and therefore their contribution to vaccination services is not assured.

The field visit revealed that the Bouaflé rural health center was well organized and trained on immunization coverage issues. The nurse had qualitative data on his target population, distance of surrounding villages, and coverage rates for 1998 by month and antigen. He had also calculated his monthly needs for each antigen and syringes and had conducted disease surveillance. This success in program management may be attributed to the UNICEF SSPIB project in which all district and rural health staff were trained in 1994. Unfortunately, many of the staff have been relocated to other regions. This problem has weakened the immunization services for the region. Lack of resources, personnel, and material also limits their capacity to increase coverage rates. They have not had the yellow fever vaccine for two months. The women who come to the rural health center for vaccinations leave discouraged by the discontinuity of services.

Tiassalé district health center has completed training for their ASCs in 1998. The district health center has also written a proposal with the World Bank to train all health staff on immunization services and coverage. Yamoussoukro has not completed any training for its personnel.

Fixed Strategy

This strategy affects members of the population who live less than 5 km. from a health center. The health centers organize vaccination sessions on average twice a week.

Outreach Services

The outreach strategy is organized for segments of the population, which live on average between 5 and 10 km from the health center. As opposed to the fixed strategies, the health center staff travels to the population using motorcycles to provide vaccination services.

The district of Bouaflé is one of the rare districts that organize this strategy. In 1998, the health centers organized 315 outreach services. Nevertheless, the increasing maintenance problems with the motorcycles donated by UNICEF in 1996 has limited the capacity of this approach in 1999. It is also necessary to mention the problem in obtaining fuel. Frequently this expense must be assumed by the cost recovery generated at the health center.

The district of Tiassalé has no functioning motorcycles. Therefore, 70 percent of the population, the proportion living more than 5 km from a health center, risks not receiving vaccination services. However, the nurse at the Binao health center organizes the outreach services utilizing the cost recovery of routine services and taxis.

The majority of health centers located in the district of Yamoussoukro are limited in their approach to conduct outreach services because there are very few motorcycles.

Vaccination security: conditions and problems

Although district health centers require rural health centers to burn and bury the needles and syringes, it was found that most rural health centers dispose of their needles and syringes by digging a hole and burying them. The rural center in Tiassalé (Nzianouan) burns the needles and syringes in an incinerator. There is a guard who supervises the disposal and is paid approximately FCFA 25,000 a month from routine cost recovery services. Previously, the population had been taking the syringes and containers for use with indigenous medicines. The second rural health center in Tiassalé (Binoa) is not able to dig a hole because of the water table. The nurse throws them in the forest after each vaccination service and burns them in the dry season. In Yamoussoukro (Kongbossou) nurses burn the needles and syringes in an old well. The second rural health center in Yamoussoukro leaves their needles and syringes in a hole and covers it when it becomes full.

Education

All health centers mentioned the need for education on the importance of immunizations and how to use the services. Currently, the Yamoussoukro health centers conduct education when patients come in for routine services and are not properly vaccinated. The rural health center in Tiassalé (Nzianouan) had visited each village for community education on immunization with the ASC. The health centers stated that often the population is illiterate and does not understand when they need to return. Women sometimes believe that vaccinations prolong pregnancy or make their children sick. The need for education is complicated by the nurses' preoccupation with routine services.

Costs

The resources utilized for vaccination services are subdivided into two groups: recurrent and fixed costs. In terms of operating district health centers, there are certain items which are used uniquely for vaccinations and others which are used for additional health services. The cost of the items, which are used for additional health services, is based on the level of intensity used in the vaccination activities. The visits to the districts of Bouaflé, Tiassalé, and Yamoussoukro provide the

opportunity to examine the resources available for vaccination services at the district and rural level and to identify the recurrent costs which, are imposed on the health centers.

The recurrent costs are composed of personnel, vaccines, vaccination supplies (needles and syringes as well as alcohol and cotton), office supplies (such as registers and vaccination cards), office furniture, fuel, and maintenance. In terms of fixed costs, aside from building costs, the government does not provide budgets to district health centers for cold chain equipment and vehicles. Donations by external agencies act as a supplement but are not sustainable.

The following analyses of recurrent costs are based on information from the Bouaflé district health center and serve to represent the trends in recurrent costs at the district health centers throughout the country. Bouaflé district health center was chosen due to the comprehensive information that was available.

Operating Budget

The budgets presented are the operating budgets and do not include the salaries of health staff at the district and the rural health centers. The district and rural health structures are responsible for the majority of vaccination activities. The activities, which occur in hospitals, are minimal and negligible. The information was collected from the accountant, director, and NIP coordinator at the district health center.

Table B-4. Operating Budget of the Bouaflé District Health Center, 1998

Item	Amount (US$)	Amount NIP (US$)	Percentage NIP
Alimentation	806.00	0.00	0
Office equipment	9,416.00	2,354.00	25
Technical equipment	10,580.92	2,116.18	20
Local maintenance	22,609.88	3,391.48	15
Vehicle maintenance	8,568.57	5,998.00	70
Fuel	30,266.67	15,133.33	50
Total	$83,555.03	$29,449.44	35%

In 1998, the district of Bouaflé consumed a total operating budget of US$ 83,555.03, of which 35 percent (US$ 29,449.44) was designated for vaccinations. The rural health centers consumed 49 percent (US$ 39,999.82) of the budget. In an overall NIP budget, personnel represent the most important cost, 38 percent. Vaccines and syringes represent approximately 30 percent.

Table B-5. Total Recurrent NIP Costs by Input, Bouaflé District Health Center, 1998

Cost	Amount (US$)	Percentage
Personnel*	34,750.00	38
Vaccines	19,517.98	21
Syringes + Needles	8,284.63	9
Items from the operating budget	29,449.44	32
TOTAL	$92,002.05	100%

*Personnel only includes staff at the district health center

The districts visited revealed that there was a recurrent problem in terms of maintaining cold chain equipment, vehicles, and motorcycles. There is no technician at the district level with the capacity to maintain the different types of refrigerators given by the donor agencies. Overall, maintenance of resources is limited. Neither the government nor the external agencies take responsibility for maintaining the equipment given to the districts. This creates a cycle in the immunization services where conditions improve after interventions by external agencies but are not sustained. The budget for fuel, which is calculated at the national level, is often incorrect because poor roads may require the NIP team to double its distance by taking a different road. As there is already a shortage at the district level, rural health centers also become faced with this issue. UNICEF provided Bouaflé with motorcycles, vaccine carriers, and refrigerators for all health centers in 1994. The fuel and other recurrent expenses were paid by UNICEF (SSPIB) until 1996. The program has since been experiencing difficulties as the equipment is aging and it is not able to maintain budgets to cover recurrent expenses (fuel and maintenance). The rural health center also mentioned the problem with gas for the refrigerator. The gas refrigerator consumes two bottles of gas a month, which equals nearly $15 including transport. This expense becomes a burden for the rural health center.

Financing

The principal sources of financing for the NIP are the Ivorian government, international organizations, and Rotary International. The Ivorian government is responsible for financing the human resources (salary), vaccines (BCG, DPT, measles, yellow fever, OPV, and TT), as well as syringes and needles. Rotary International donates the polio vaccine. Financing by the population is indirect. They are responsible for their transport and vaccination cards. The community supports vaccination activities through its participation in the COGES, the ASCs, and the health center assistants. However, the health center assistants receive a proportion of the cost recovery receipts as an incentive. The rural health centers also do not benefit from local taxes or insurance to subsidize the costs; however, the Health Action Fund (*Fonde Action de Santé*), an obligatory contribution to the MOH, is reduced only by 10 percent for the rural health centers where as in urban centers it is 35 percent. The government and the international organizations finance equipment. Communities that have identified the need for a health center may utilize the regional rural improvement fund. This project subsidizes local resources for the development of rural health centers and maternities.

The districts visited are experiencing difficulties due to the budgetary constraints at the national level. During the visit conducted in July 1999, the district health centers had not yet received their budgetary allocation. These difficulties will inevitably affect the activities programmed at the districts and vaccination coverage rates will suffer. A visit to a rural health center in the Tiassalé district revealed that coverage rates are already 50 percent below the expected average for the July period and that reaching an 80 percent coverage rate will be impossible by the end of 1999.

National Immunization Days

Structure and Strategy of NIDs

The objective of the NIDs is to eradicate polio. The campaign targets segments of the population that are not reached during routine vaccinations. The NIDs are conducted twice a year for three days and target all children ages birth to five years. The two principle strategies used are:

- Fixed strategy: administers vaccines at fixed sites such as health centers, schools and public areas.

- Mobile strategy: utilizes teams they travel door to door to ensure vaccination of all children.

In order to conduct NIDs, health centers must rely heavily on volunteers from the community. These volunteers are composed of ASCs, students and NGO members and are paid US$ 1.67 a day. The only criterion for participation is the ability to read and write.

All districts use similar social mobilization strategies. Information publicizing NIDs is transmitted through local administrative, religious, and customary authorities and local radio programs. The strategies are very effective; however, NIDs create some confusion among certain segments of the population due to the perception that vaccines received at this time are comprehensive for all antigens. Thus, after NIDs, the children are not brought back to the health centers for routine immunizations.

The level of coverage for NIDs in the three districts evaluated revealed coverage rates surpassing 100 percent of the target population. It is interesting to note that in 1999 the NIDS were conducted in April. The central region of Yamoussoukro experiences population swells during this period as it falls at the end of the growing season and the population returns from the plantations in the south. Coverage rates during this period surpassed 200 percent.

Costs and Financing

The organization of NIDs 1999 in the district of Bouaflé consumed a budget of US$ 28,243.82. This amount represents 31 percent of the recurrent annual resources utilized by this district in 1998 to assure the routine vaccination services. In addition, the amount of polio vaccine consumed during this campaign is estimated at US$ 17,725.68, which corresponds to 91 percent of the total consumption in 1998 for routine vaccination services. During the NIDs the local administrative and civil authorities as well at NGOs temporarily donated the use of their vehicles.

Table B-6. Recurrent Costs for NIDs, Bouaflé District, 1999

Resources	Amount (US$)
Vaccines	17,725.68
Per Diem	3,295.00
Fuel	7,223.14
TOTAL	$28,243.82

The districts of Tiassalé and Yamoussoukro utilized significant amounts of resources during the NIDs. Unfortunately, the information was not available to evaluate the level of resources utilized during this period of study.

The financing of NIDs comes from multiple sources: the Ivorian government, Japanese Cooperation, Rotary, AXA insurance and UNICEF. Information about the participation of each group is not available at the district level.

Observations

Evaluation of the NIDs at the local level provides the following observations by the district-level NIP teams:

- The availability of resources was delayed and the program was changed several times at the central level, resulting in disorganization and poor planning.
- The internal and external mobility of the population made the overall campaign difficult to carry out.
- The personnel, taking into account the level of effort required, considered the per diem rate of US$ 1.67 a day insufficient.
- The amount of resources mobilized was considered excessive for one antigen.
- There is no method for determining whether the child was vaccinated prior to the NID or to signal for future vaccination coverage strategies.
- NIDs create disruptions in services provided by the health centers. Essentially, no care is available during the NIDs.

Remarks and Conclusions

The study conducted in the districts of Bouaflé, Tiassalé, and Yamoussoukro made the following remarks and recommendations:

- As of July 1999, the district health centers have not received their budgetary allocation.
- There are insufficient resources at the district level including cold chain equipment, vehicles, fuel, and personnel.
- Vehicles, motorcycles, and cold chain equipment that do exist are not properly maintained.
- There are no technicians available to assure the maintenance of cold chain equipment.
- The estimation of vaccine and supplies needed for the districts by the INHP is inaccurate and creates stock shortages.
- The districts health centers believe that the introduction of new vaccines should not occur until the current problems of vaccine and supply shortages is addressed.
- The safe disposal of injection material varies widely among health centers.
- The NIDs utilize an excessive amount of resources for one antigen.
- The population requires additional education concerning the importance of immunizations.
- District health centers lack the authority necessary to make management decisions concerning staff and resource allocation.

- The training and tools necessary to establish objectives, calculate target populations, and manage the information of vaccination activities at the district level are not available except in Bouaflé.

Annex C. Vaccine Costs

Table C-1. Vaccines Bought PSP/INHP, 1998, by Supplier

Vaccine	Supplier	Presentation	Unit Price FCFA	Quantity	Amount (FCFA)
TT	Chiron	Single dose	420	3,000	1,260,000
Flu vaccine	Chiron	Single dose	1,500	3,000	4,500,000
Hib vaccine	Chiron	Single dose	3,200	10,000	3,200,0000
Meningitis A+C	Chiron	Single dose	500	20,000	10,000,000
Oral polio	Chiron	20 doses	790	83,760	66,170,400
Measles	Chiron	10 doses	700	78,480	54,936,000
MMR	Chiron	Single dose	1,100	15,000	16,500,000
Yellow fever	IPD	10 doses	1,480	98,100	145,188,000
Serum antirabies	PMC	N/A	4,000	300	1,200,000
Serum antitetanus	PMC	1500 UI	450	70,000	31,500,000
Tuberculosis test	PMC	1500 UI	450	70,000	31,500,000
Antirabies	PMC	Single dose	4,000	40,000	160,000,000
BCG	PMC	20 doses	1,500	81,050	160,000,000
DPT	PMC	20 doses	800	55,840	44,672,000
Hep B 10=g/ag HBs	PMC	Single dose	1,300	2,000	2,600,000
Hep B 20=g/ag HBs	PMC	Single dose	1,500	10,000	15,000,000
Hep B 20=g/ag HBs	PMC	10 doses	14,500	10,000	145,000,000
Pneumococcus	PMC	Single dose	3,000	2,000	6,000,000
Measles	PMC	10 doses	750	19,620	14,715,000
Typhoid capsule	PMC	Single dose	3,500	15,000	52,500,000
Antitetanus serum	S I of I	1500 UI	366	105,000	38,430,000
Antitetanus vaccine	S I of I	20 doses	355	138,100	49,025,500
DPT	S I of I	20 doses	670	83,760	56,119,200
DPT+ Hep B	SKB	10 doses	7,800	67,400	525,720,000
Meningitis A+c	SKB	50 doses	4,450	16,000	71,200,000
Oral polio	SKB	20 doses	800	55,840	44,672,000
Oral polio	N/A	10 doses	790	N/A	N/A
INHP Total Sales,Vaccines in FCFA					1,780,408,100
	1993	**1994**	**1995**	**1996**	**1997**
NIP Vaccines	313,566,865	-	660,259,150	552,318,920	833,952,467
Non-NIP Vaccines	119,650,000	-	553,998,367	352,761,391	628,225,300
Total	433,216,865	-	1,214,257,517	905,080,311	1,462,177,767
NIP/total	72.38%				57.03%

Sources: INHP, PSP

Annex D. Bibliography

Assani, Aliou. May 1999. “Les indicateurs synthétiques de suivi et d’évaluation des volets PMA, SR et MST/SIDA/TUB en Côte d’Ivoire, Rapport de Fonds.” Abidjan: Ministry of Public Health.

Bouyssou, Claude et al. September 1998.“Etude sur les Normes et Standards des Infrastructures et des Equipements Sanitaires pour les Soins de Santé Primaire et de Première Reference no. 90 70 012.” Kreditanstalt fur Wiederaufbau (KFW).

Brenzel, Logan and Claquin, Pierre. 1994. “Immunization Programs and Their Costs.” *Social Science and Medicine.* 39(4)527-36.

Brenzel, Logan. 1991. “The REACH Experience: Cost and Financing of EPI.” Resources of Child Health Project.

Creese, Andrew and Parker, Daniel (eds.). 1994. “Cost Analysis in Primary Health Care: A Training Manual for Program Managers.” Washington, DC: World Health Organization.

DeRoeck, Denise and Levin, Ann. 1998. “Review of Financing of Immuization Programs in Developing and Transitional Countries.” Special Initiatives Report 12. Bethesda, MD: Partnerships for Health Reform, Abt Associates Inc.

Direction de l’Equipement et de la Maintenance. April 1999. “Commission de Gestion des Equipements du EPI, and Inventaire des Equipements du EPI.” Abidjan: Ministry of Health.

Direction Executive du EPI. July 1998.“Rapport d’Activités a mi parcours.” Abidjan: Ministry of Public Health.

Direction Executive du EPI. November 1998. “Rapport Annuel d’Activités.” Abidjan: Ministry of Public Health.

“First Annual Meeting of National EPI Directors and Logisticians for West Africa Countri 1999.

Gesellschaft für Technische Zusammenarbeit. 1999. “Projet Assistance en Matiere de Santé Publique et

Guimier, J.P., 1992. “Rapport sur la Pharmacie de Santé Publique” Union Europeanne, Bruxelles, 1992.

Gwatkin, Davidson, Rustein, Shea, Kiersten, Johnson, Pande, Rohini and Wagstaff, Adam. February 2000. “Socio-economic Differences in Health, Nutrition, and Population in the Côte d’Ivoire” HNP/Poverty Thematic Group of the World Bank.

Institut National d’Hygiene Publique. 1998. “Rapport d’activité 1998 et Annexes.” Abidjan.

Japan International Cooperation Agency. “Plan de distribution des équipements du projet d’éradication de

a Statistique.

Ministère de la Planification et de la Programmation du Développement. 1999. “Enquête Démographique -1999.” Rapport préliminaires. Institut National de la Statistique.

Ministère de la Santé Publique. 1996a. “Deuxièmes Journées de Bilan des Activités du Ministre de la Santé Publique pour l’Année 1996.” Abidjan.

Ministère de la Santé Publique, 1996b. “Plan de suivi du projet ‘Soutien au Programme Elargi de Vaccination 95 66 365’ annexe du rapport annuel EPI

Ministère de la Santé Publique. 1997a. “Journées de Bilan des Activités 1995, Rapport General.” Abidjan.

Ministère de la Santé Publique. 1997b. “Rapport Annuel sur la Situation Sanitaire (RASS) 1997.” Abidjan.

Ministère de la Santé Publique. 1997c. “Rapport General, Troisièmes Journées Bilan du Ministère de la Santé Publique pour l’année 1997.”

Ministère de la Santé Publique. 1998. “Rapport Annuel sur la Situation Sanitaire (RASS) 1998.” Abidjan.

Ministère de la Santé Publique. 1999a. “Rapport Annuel sur la Situation Sanitaire (RASS) 1999.” Abidjan.

Ministère de la Santé Publique. March 1999b. “Indicateurs synthétiques de suivi et d’évaluation des volets PMA, SR/PF et MST/SIDA/TUB du PDSSI, Validation des travaux des responsables de volets.”

Ouattara, M. Marcel. February 1999. “Etude du coût et du financement du paquet minimum d’activités en Côte d’Ivoire.” Abidjan: Ministère de la Santé Publique.

Schonhals, Christian et al July 1995. “Etude de Faisabilité Soutien au Programme National de Vaccination, Rapport Final.” Ministère de la Santé et de la Protection Sociale, KFW.

Tapinos, Georges Photios et al. May 1998. “Etude Relative aux Defis Demographiques Majeurs et au Developpement Durable en Côte d’Ivoire.” Bureau Nationale d’Etudes Techniques et de Developpement.

Tchicaya, Anastase. May 1999. “Rapport de Mission sur la Sécurisations des Fonds et Epidémies dans Les Pays D’Afrique de l’Ouest, Expériences du Burkina Faso et du Mali.” AEDES.

UNICEF. 1999. “Rapport sur les fonds Japonais pour les Journées Nationales de Vaccination 1999.”

UNICEF and République de Côte d’Ivoire. 1996.“Analyse de la Situation des Femmes et des Enfants de

UNICEF. 1998/1999. “Donnée des EDS.”

United Nations Development Fund. 1997. “Rapport National sur le développement humain Côte d’Ivoire.”

United States Agency for International Development. 1997. “USAID Grant to UNICEF for IMCI, EPI,

United States Agency for International Development. 1998. “USAID Grant to UNICEF for Polio Activities 1998/1999.” Washington, DC.

World Bank, 1998. “World Development Report.” Washington, DC.